CONFERENCES

IMPERIAL AGRICULTURAL RESEARCH CONFERENCE, 1927

Abstracts of Papers

on

Agricultural Research

in the

United Kingdom

published during the year October, 1929 to September, 1930.

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PREFACE.

The present volume is a continuation, for 1929-30, of a volume prepared for the Imperial Agricultural Research Conference, 1927. It contains abstracts of papers published in the academic year October, 1929, to September, 1930, dealing with agricultural research work in the United Kingdom. The papers abstracted have been limited to those dealing with results or methods of research work in agriculture. The abstracts have been made by the investigators themselves. For research and investigational work at present in progress reference should be made to a companion volume containing reports on the work in progress at research institutes, etc., in the academic year 1929-30, copies of which may be obtained, free and post free, from the Ministry of Agriculture and Fisheries at the address given below.

The arrangement on the basis of subjects is shown in the contents sheet on page 4. Under each subject the work of research institutes is first dealt with, followed by the work of advisory centres. In appendices are given (1) a list of research institutes, advisory centres, Government departments, etc., contributing the abstracts contained in the volume, with the pages on which their abstracts respectively appear, (2) a list of the authors, with pages on which their abstracts appear, (3) a list of abbreviations of titles of periodicals, etc., used in the volume, and (4) a more detailed list of the subjects than is contained in the contents sheet, with reference to pages.

Copies of the volumes for the academic years 1926-7, 1927-8 and 1928-9 are still available, and may be obtained, price 1s. net each volume, from the Ministry of Agriculture and Fisheries.

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(A.) SOILS, MANURES, PLANT NUTRITION AND GENERAL CHEMISTRY.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

FAGAN (T. W.) and DAVIES (R. O.). **The recovery of nitrogen in pastures from the application of Nitrogenous Manures.** *Welsh J. Agric.*, Vol. vi.

A study of the results obtained from experiments carried out at the Welsh Plant Breeding Station on the effect of soluble nitrogenous manures on pastures reveals that more extra nitrogen was recovered in the pasture than would be possible if the artificial manures were the only source of this nitrogen. The interference of sheep as a disturbing factor is discussed, and it is emphasised that a true interpretation of the effect of soluble nitrogen on pastures is impossible without a quantitative knowledge of the part played by the animal.

The weekly cuts at Brickfield show that the recovery of nitrogen even in the case of a manure such as nitrate of soda and under conditions of high rainfall takes some time before it is completed. While part of the nitrogen is recovered immediately, a considerable portion is returned in the plant three weeks after its application. It is known that soluble nitrogenous manures encourage the growth of soil bacteria, the proteins of which are subsequently rendered available to the plant. There is, however, such a high increment of plant nitrogen as a result of nitrogenous manuring that a further possibility is suggested, viz., that the manure has the indirect effect of rendering a larger quantity of the soil nitrogen available as plant food than would have been rendered without its application.

A very high rate of protein synthesis is possible by heavily manuring a grass with soluble nitrogen. It is shown, however, that the rate of protein synthesis affected by means of clover to which no nitrogen has been applied is by no means insignificant in comparison with this, even when the clover is grown under adverse circumstances. A close comparative study of these two methods of protein synthesis would therefore be of both scientific and practical importance, especially in view of the large amount of work on clovers which has already been carried out by the Welsh Plant Breeding Station.

FAGAN (T. W.) and REES (JOHN). **The effect of cutting sainfoin at different stages on the yield and chemical composition of hay and aftermath.** *Welsh J. Agric.*, Vol. vi.

The results generally go to confirm the work previously carried out at Aberystwyth with the hay and aftermath of grasses, namely, that:—

1. The earlier the hay is cut the more nutritious it is in consequence.
2. Delay in cutting results in a greater yield of produce, but the quality is inferior.
3. Comparison of the chemical composition of the four sets of hays of common sainfoin cut at succeeding dates illustrates the deterioration that takes place with delay in cutting. Thus there is a fall in the protein content accompanied by a rise in fibre.
4. The leaf of sainfoin is much higher in nutritive value than the stem, and the proportion of stem to leaf in the hay has a very considerable influence on its nutritive value.
5. The chemical composition of the aftermaths shows all the characteristics of a young leafy growth.

FAGAN (T. W.) and WATKIN (J. E.). **The chemical composition of Barley Grain and Straw grown in Mid-Wales.** *Welsh J. Agric.*, Vol. vi.

(1) In suitable seasons, the crop grown on the best barley land in Mid-Wales compares favourably both in yield and chemical composition of grain and straw with that grown in other parts of Britain.

(2) Soil, altitude and the variety grown affect the percentage of the different constituents determined in both grain and straw.

(3) The wide variation in chemical composition of the grain grown in the area emphasises the necessity, if reasonable accuracy is to be attained in building up rations, of a more accurate knowledge of its composition grown in different localities.

(4) The feeding value of the dry matter of the straw as shown by its chemical composition is very appreciably affected by the quantity of bottom growth it contains.

(5) The chlorine content of the dry matter of the straw is shown to be influenced by proximity to the sea.

FAGAN (T. W.) and PROVAN (A. L.). **The Effect of Manures on the Nitrogenous and Mineral content of Upland and Lowland pastures.** *Welsh Plant Breed. Stat. Bull. Series H*, No. 11, Seasons 1921–1929.

1. The application of phosphates and potash has resulted in an increase in the average percentage of nitrogen and phosphoric acid content of the herbage at all centres, both upland and lowland.

2. Though no lime as such was applied to the plots, the addition of phosphates (superphosphate) and potash has resulted in an increase in the average percentage of lime in the herbage of the large majority of the plots.

3. The effect of applying nitrogen in addition to phosphates and potash has been to depress the average percentage of phosphoric acid and lime and at the lowland centres if anything to depress even the nitrogen.

STAPLEDON (R. G.). **Land Reclamation.** *J. Surv. Inst.*, Vol. x, Part 3, pp. 101–112. Sept., 1930.

The influence of mechanical treatment and the application of manures in reference to the establishment of renovating seeds is discussed. The importance of simple mixtures containing excess of wild white clover and of appropriate bottom grasses with indigenous strains of cocksfoot or perennial ryegrass for the formation of pastures is dealt with. It is suggested that for the poorest situations "cleanings" containing Yorkshire fog may frequently be usefully employed.

STAPLEDON (R. G.) and THOMAS (M. T.). **The Yield of Sharply Contrasting Pasture Types and their Response to Manures.** *Welsh Plant Breed. Stat. Bull.*, Series H, No. 11, pp. 3–26. June, 1930.

The yields of pasture (permanent and leys) at ten different centres are compared both with and without the application of simple schemes of manuring.

The yield from the best valley pastures was about seven times greater than that from an upland sheep grazing. An interesting result was the fact that the upland pastures gave a greater percentage increase in response to incremental doses of inorganic nitrogen than did the lowland. At all centres the application of nitrogenous fertilisers tended to reduce the white clover.

LONG ASHTON FRUIT RESEARCH STATION.

WALLACE (T.). **Experiments on the Effects of Leaching with Cold Water on the Foliage of Fruit Trees. I. The Course of Leaching.**

of Dry Matter, Ash and Potash from the Leaves of Apple, Pear, Plum, Black Currant and Gooseberry. *J. Pomol. and Hort. Sci.*, Vol. viii, 1930.

Healthy leaves of well-known varieties of apples, pears, plums, black currants and gooseberries were subjected to leaching treatment for four successive periods of twenty-four hours by immersing in distilled water at laboratory temperatures.

Observations were made on the effects of the treatments on the appearance of the leaves, and the amounts of dry matter, ash and potash leached by each treatment were estimated.

The various classes of fruit and the different varieties showed variations in behaviour under the treatment but considerable amounts of material were leached in each case.

The course of the leaching is shown by means of summation curves.

WALLACE (T.). **Experiments on the Manuring of Fruit Trees. III. The Effects of Deficiencies of Potassium, Calcium and Magnesium respectively on the Contents of these Elements and of Phosphorus in the Shoot and Trunk Regions of Apple Trees.** *J. Pomol. ana Hort. Sci.*, Vol. viii, 1930.

Experiments with apple trees in sand cultures are described in which the deficiency treatments, potassium omitted, calcium omitted, magnesium omitted were given.

The effects of the treatments on the growth characters and on the composition of the leaf, shoot and stem portions of the trees are described.

The deficiencies all produced significant effects on the growth features and the composition of the ash of the portions analysed.

WALLACE (T.). **Some Effects of Deficiencies of Essential Elements on Fruit Trees.** *Ann. Appl. Biol.*, Vol. xvii, 1930.

The paper formed one of a series of a symposium on "The Nutrition of Fruit Trees" held by the Association of Economic Biologists.

An outline of investigations on the subject prior to 1920 is given and the results of the earlier work are summarised. It is shown that the field methods used did not yield much fundamental knowledge of the problems involved.

The results obtained at Long Ashton relating to deficiencies of nitrogen, potassium, phosphorus, calcium, magnesium and sulphur respectively on various classes of fruit are given.

WALLACE (T.). **The Role of Mineral Elements in the Nutrition of Fruit Trees.** *Brit. Assoc. Meeting, Agric. and Bot. Sections.* Bristol, Sept., 1930.

An account is given of the effects of deficiencies of nitrogen, potassium, phosphorus, calcium, magnesium and iron on fruit trees.

WALLACE (T.). **Studies in the Nutrition of Fruit Trees.** *Proc. Internat. Cong. Plant Sciences.* Ithaca, N.Y., 1926, Vol. 2, 1929.

The paper summarises the results obtained in pot experiments at Long Ashton in connexion with deficiencies of the major elements and the balance of $\frac{\text{nitrogen}}{\text{potassium}}$ and $\frac{\text{potassium}}{\text{magnesium}}$ in the nutrition of fruit trees.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

AMOS (J.), HATTON (R. G.) and HOBLYN (T. N.). **The Response of Apple Trees on Known Rootstocks to Applications of a Complete Fertiliser.** *Ann. Appl. Biol.*, 1930. **17**, 657–674.

A simple experiment, wherein a plot of apple trees receiving applications of a balanced manure has been compared with a similar plot which has received nothing but applications of non-leguminous green crops, has now been conducted for eleven seasons.

On land which was in "good heart" at the time of planting, the trees showed no response to manuring during their first six years' growth.

From the seventh year onwards to the present date, very definite differences began to appear between the two plots in vigour, cropping, size and quality of fruit and health of the trees.

Of the varieties used, Bramley's Seedling has suffered from the starved conditions to a greater degree than Worcester Pearmain.

The same variety budded upon different rootstocks shows a marked differential response; trees on rootstocks in the "semi-dwarfing" group have suffered earlier and more markedly than those on the vigorous group of rootstocks.

It is also demonstrated that a rootstock inducing really bad performance, such as the poor crops and small fruits produced by trees on Doucin Ameliore (No. V), still gives bad trees, even when subjected to balanced manuring.

GRUBB (N. H.). **The Reaction to Potash Fertilisers of Apple Trees in the Field.** *Ann. Appl. Biol.*, 1930. **17**, 674–681.

The application of sulphate of potash over a period of years to part of the "Apple Pruning Plot" at East Malling has resulted in:—

(1) A great reduction of "leaf scorch."
(2) Greatly increased growth of the trees.
(3) A great increase in weight of crop and size of fruit.
(4) In some cases better "setting" of the blossom.
(5) In a few cases a probable reduction of blossom bud formation.
(6) Heightened fruit colour, except where increased foliage shades the fruit.
(7) No reduction of disease, except probably apple mildew (and "leaf scorch").
(8) In one or two cases foliage more resistant to "spray injury."

ROTHAMSTED EXPERIMENTAL STATION.

ARNOLD (C. W. B.) and PAGE (H. J.). **Studies on the Carbon and Nitrogen Cycles in the soil. II. The extraction of the organic matter of the soil with alkali.** *J. Agric. Sci.*, 1930, Vol. 20, pt. iii, pp. 460–477.

Although the total organic carbon in the soils of various plots of the classical permanent experiments at Rothamsted receiving, respectively, organic, artificial and no manures, varied between 0·81 and 2·91 per cent. and in the subsoils between 0·54 and 1·04 per cent. of the oven dry samples, there was a marked similarity between the properties of their organic matter, especially in its behaviour on extraction with cold and hot dilute caustic soda. Colorimetric examinations of the extracts indicate that the organic carbon of the surface soils is more deeply coloured than that of the corresponding subsoils, that the organic carbon is most deeply coloured in extracts from surface soils receiving annual dressings of dung, and that that from subsoils of plots receiving no manure is least coloured.

BRENCHLEY (W. E.). **The Varying Effect of Lime on Grassland with Different Schemes of Manuring.** *J. Min. Agric.*, pp. 663–73, 1930.

Experiments extending over the past ten years indicate that lime *in conjunction with organic manures* may be detrimental rather than beneficial to grassland on heavy soils as at Rothamsted, particularly if artificial fertil-

isers are also applied. The rate of lime application is an important factor in determining its effect, and light dressings may be beneficial at first but become useless or harmful if repeated too frequently. On areas which have become acid owing to repeated applications of ammonium sulphate lime not only improves the quantity and quality of the herbage, but enables it to withstand severe conditions of frost and drought such as obtained in the winter 1928–29.

CROWTHER (E. M.). **Note on the Phosphoric Acid of Barley Grain.** *J. Inst. Brew.*, 1930, **36**, (27 New Series), 349–351.

Determinations of phosphoric acid in barley grain from experimental plots conducted in connection with the Institute of Brewing Research Scheme showed that the total range of values was rather narrow (0·74 to 1·18 per cent. P_2O_5 in dry matter) and not closely connected with other analytical data from the samples. There was evidence that it was slightly increased by phosphate and slightly decreased by nitrogenous manuring.

CROWTHER (E. M.). **Influence of fertilisers on the yield and composition of potatoes.** *Repts. of the* 1930 *Brit. Assoc. Meeting, Section M.*

A short abstract is given of the results of fertilisers trials on potato yield and of the influence of fertilisers on the cooking quality and chemical composition of potatoes in Rothamsted and Woburn fertiliser treatment were much smaller than the differences between the two centres. Nitrogenous manures increased the protein content and potassium manures reduced it by reducing the dry matter content.

CROWTHER (E. M.). **Soils and Fertilisers.** *Ann. Repts. on the Progress of Appl. Chem. of the Soc. Chem. Ind.*, 1929, **14**, 511–559.

In the course of an annual survey of the progress of soil and fertiliser investigations, especial attention is given to methods of soil survey, types of soil formation, the composition of the soil colloids, the use of the newer fertilisers, the iodine question and soil fertility of sugar cane soils.

CROWTHER (E. M.). **The Relationship of Climatic and Geological Factors to the Composition of Soil Clay and the Distribution of Soil Types.** *Proc. Roy. Soc.*, B, **107**, (1930), 1–30.

The effects on soil formation of two climatic factors (mean annual rainfall and mean annual temperature) and a qualitative geological grouping are separated by the examination of data for clay fractions of 30 representative American soils using a statistical analysis capable of application to other geographical and ecological problems. The ratio of silica to alumina in the clay is correlated negatively with rainfall and positively with temperature and the relative effects of rainfall and temperature on clay are closely parallel to their effects on the amounts of drainage through soil in the Rothamsted lysimeter experiments. For comparable climatic conditions the lowest SiO_2/Al_2O_3 ratios are in sedentary soils from igneous rocks and the highest in soils derived from loose sediments repeatedly subjected to reworking in water.

CROWTHER (E. M.). **Climate, Clay Composition and Soil Types.** *Paper read at Conf. Internat. Soc. Soil Sci.*, Leningrad.

CROWTHER (E. M.) and HEINTZE (S. G.) (in part). **Report of the Soil Reaction Committee of The International Society of Soil Science. Part I. Results of comparative investigations on the Quinhydrone Method. Part II, Conclusions and Recommendations.** *Soil Research* (1930), **2**, 28–139, 141–152.

This is the report of a Committee set up in 1929 as a result of criticisms by S. G. Heintze and E. M. Crowther and others of the standard quinhydrone method for soil reaction measurements. The comparative determinations in seven laboratories confirm the conclusions that the method may give highly erroneous results. The International Society has since adopted the recommendations made in Part II of the Report that a rapid preliminary test of the suitability of the soil for the quinhydrone technique should precede all precise measurements. In a special section of Part I. E. M. Crowther and S. G. Heintze bring forward additional evidence that the errors are due to a reduction of manganese dioxide to an alkaline product.

Crowther (E. M.) and Heintze (S. G.). **Oxides of Manganese and the quinhydrone error in Measurements of soil reaction.** *Paper read at Conf. Internat. Soc. Soil Sci.*, Leningrad.

Crowther (E. M.) and Troell (K. E.). **Oxidation of organic matter in the pretreatment of soils for mechanical analysis.** *Paper read at Conf. Internat. Soc. Soil Sci.*, Leningrad.

Greenhill (A. W.). **The availablity of phosphatic fertilisers as shown by an examination of the soil solution and plant growth.** *J. Agric. Sci.*, 1930, **20**, 559–572.

The rate of growth of barley and changes in the phosphate concentration of the soil solution were followed in pots containing an acid soil limed at two rates and comparing slag, superphosphate, and no phosphate treatment. Liming increased the phosphate concentration. The effects of phosphatic fertilisers were somewhat variable; on lightly limed soil they reduced the phosphate concentration. There was no correlation between crop growth and phosphate concentration. It appears therefore that barley must take up phosphoric acid directly from the solid particles of soil or fertiliser.

Haines (W. B.). **Studies in the Physical Properties of Soil. V. The Hysteresis Effect in Capillary Properties, and the Modes of Moisture Distribution associated therewith.** *J. Agric. Sci.*, 1930, Vol. xx, Part 1.

A further study is made of water distribution in an ideal soil by means of carefully piled bronze balls and paraffin oil. A distinction is drawn between the conditions of rising and falling "moisture." For falling moisture the pressure deficiency for which the meniscus can retreat into the internal cellular structure is in the neighbourhood of 12 T/r, while for rising moisture the liquid can return whilst still under a pressure deficiency of 6·9. An examination of water equilibrium in "glistening dew" forms a link with the behaviour of soil, and the investigation illustrates the importance of hysteresis in capillary properties of soil.

Jensen (H. L.). **Decomposition of Keratin by Soil Micro-organisms.** *J. Agric. Sci.*, 1930, Vol. xx, pp. 390–398.

Keratin, prepared from horn meal, added to moist soil and allowed to decompose in the laboratory, was found to undergo a decomposition resulting in a slow accumulation of ammonia and nitrate. The addition of keratin produced no significant increase in the number of bacteria able to grow on agar, but markedly increased the number of actinomycetes, especially in garden soil. Two strains of actinomycetes were isolated and found capable of thriving in pure culture on keratin and forming ammonia therefrom.

Kalniņs (A.). **Aerobic Soil Bacteria that Decompose Cellulose. (with summary in Latvian).** *Latvijas Universitātes Raksti*, 1930. Lauksaimniecibas Fakultātes Serija I. 11, pp. 221–312.

A number of aerobic bacteria that decompose pure cellulose have been isolated from 28 samples of English soils. 48 strains are described. All except one are widely distributed in English soils and appear to belong to new species. The conditions of growth have been studied in considerable detail. It was found that the organisms can derive energy from other carbohydrates besides cellulose. One species, *Bacterium protozoides*, was able to produce a substance resembling glucose from cellulose in quantities up to 30 per cent. of the original cellulose.

KEEN (B. A.). **"Single Value" Soil Properties. A Study of the Significance of Certain Soil Constants. IV. A Further Note on the Technique of the "Box" Experiment.** *J. Agric. Sci.*, 1930, Vol. xx, Part 3.

Experiments on the effect of impacts on the amount of precipitated silica that can be packed into a Keen-Raczkowski box suggest that, like the weight per unit volume, the "swelling" is a function of the degree of packing to which the material is subjected during the filling of the box. Further, the fact that such inert material as precipitated silica can show a "swelling" when saturated with moisture raises the question as to how far imbibitional moisture is concerned in the volume expansion of soil.

KEEN (B. A.) and SCHOFIELD (R. K.). **Formation of Streamers in Sedimentation.** *Nature*, 1930, Vol. 126, No. 3168.

A discussion is given of the system proposed by C. E. Marshall for mechanical analysis of clays with the aid of a high-speed centrifuge. The method consists essentially in pouring a thin layer of aqueous clay suspension on the top of a sugar solution. The streamers which form when this system is left under the influence of gravity are attributed to the formation of a clay laden layer of sugar solution immediately below the aqueous layer. This layer, having a greater density than the solution below, breaks up and streams downwards. The authors inquire whether this phenomenon may not render invalid Marshall's calculation, in which it is supposed that the particles sediment individually through the sugar solution.

KEEN (B. A.) and BLAIR (G. W. SCOTT). **Plastometric Studies of Soil and Clay Pastes.** *J. Agric. Sci.*, 1929, Vol. xix, Part 4.

Work on soil pastes is discussed as constituting a possible connecting link between that on dilute suspensions and the results of empirical tests on soil in the dry state or as it is found in the field. Constants which are obtained when clay pastes are forced through capillary tubes under pressure (by relating amount of flow in unit time to pressure) are shown to be closely related to certain field properties of soil. This method may be used (*a*) to study the effect of lime, chalk, etc., on the physical properties of soil ; (*b*) as a means of classifying soils with reference to their texture; and (*c*) to determine a "single value" constant closely related to the "sticky point."

MEIKLEJOHN (J.). **The Relation between the Numbers of a Soil Bacterium and the ammonia produced by it in Peptone solutions; with some reference to the effect on this Process of the presence of Amoebae.** *Ann. Appl. Biol.*, Vol. xvii, pp. 614–637.

Using a soil bacteria "YB" alone in liquid cultures, an inverse linear relation was found between bacterial numbers and efficiency, and the greatest rate of production of ammonia was found to correspond to a bacterial content of about 500 million per cc. ; the rate was lowered by any increase in numbers above this figure.

A greatly increased lag period was observed as a result of diluting the inoculum ten times.

Comparing a soil protozoa *Hartmanella* and "YB" against "YB" alone in sand cultures, it was found that the presence of the amoebae, while lowering the bacterial numbers, seemed to increase the rate of ammonia production.

PAGE (H. J.). **Studies on the Carbon and Nitrogen Cycles in the Soil. I.—Introductory.** *J. Agric. Sci.*, 1930, **20**, 455–459.

The term "humic matter" is defined as the dark coloured, high molecular, colloidal organic matter which is a characteristic constituent of the soil, and "non-humic matter" includes colourless chiefly soluble organic substances and undecomposed plant residues.

SCHOFIELD (R. K.) and BLAIR (G. W. SCOTT). **The Influence of the Proximity of a Solid Wall on the Consistency of Viscous and Plastic Materials.** *J. Phys. Chem.*, 1930, Vol. xxxiv, p. 248.

If, in considering the flow of a plastic material through a narrow tube, it be assumed that the velocity gradient at any point depends only on the stress at that point, it necessarily follows that the mean velocity for a given stress at the wall of the tube should be directly proportional to the radius of the tube. Although thick soil pastes conform closely to this requirement, thinner pastes, whether they show rigidity or not, give marked discrepancies. These discrepancies can be accounted for by assuming that in the immediate proximity of the wall a modification of the plastic properties occurs, which imparts an additional velocity to the bulk of the material. By first subtracting this velocity a viscosity constant is obtained independent of the dimensions of the tube.

BLAIR (G. W. SCOTT). **A Further Study of the Influence of the Proximity of a Solid Wall on the Consistency of Viscous and Plastic Materials.** *J. Phys. Chem.*, 1930, xxxiv, p. 1505.

In a previous paper (R. K. Schofield and G. W. Scott Blair) it has been shown that in order to account for the flow properties of clay pastes an anomalous region must be postulated in the neighbourhood of the wall of the tube through which the paste is caused to stream. It was assumed that this layer was relatively thin, and a single correction is made for its effect in the modified poiseuille Formula used. In this paper the modified layer is accorded a separate term in the integration, assuming for it consistency constants differing from those of the bulk of the material. The earlier "correction" term is then expressible in terms only of these consistency constants (modified and normal); of the thickness of the modified layer; and of the radius of the tube.

BLAIR (G. W. SCOTT). **The Rheology of Soil Pastes.** *J. Rheology*, 1930, Vol. i, No. 2.

This paper is a summary of work already published more fully in the Journal of Physical Chemistry.

THORNTON (H. G.). **The Influence of the Host Plant in Inducing Parasitism in Lucerne and Clover Nodules.** *Proc. Roy. Soc.* (B), 1930; Vol. 106, pp. 110–122.

The formation of fresh nodules upon inoculated lucerne seedlings placed in the dark soon ceases, and there is a cessation of cell division throughout the root. The bacteria become parasitic upon the host tissues. In old nodules on lucerne and clover plants growing in the light, the bacteria behave similarly. Bacteria from the original infection thread invade the nodule tissue, causing it to disintegrate. It is suggested that lack of carbohydrate is the basal factor in both conditions. When the air supply to lucerne seedlings growing in agar is limited, the nodules do not function normally, but, carbohydrate supply not being the limiting factor, the host tissue is not then injured.

THORNTON (H. G.). **The Early Development of the Root Nodule of Lucerne.** (*Medicago sativa*, L.). *Ann. Bot. Oxford*, 1930, Vol. xliv, pp. 385–392.

Bacteria infect the root hairs, the infection threads passing into the cortex without invading the central cylinder of the root. Cell division is thereby induced. The infection threads, naked at their growing points, tend to swell into zoogleal masses. In the older portions of the thread, a sheath is formed round them continuous with the wall of the host cell. The zoogleal masses remain unsheathed and release bacteria into the host cytoplasm. Division of the host cells ceases by the time the infection thread sheath is formed. The host cells are apparently uninjured by the bacteria save in old nodule tissue.

THORNTON (H. G.) and GRAY (P. H. H.). **The Fluctuations of Bacterial Numbers and Nitrate Content of Field Soils.** *Proc. Roy. Soc.* (B), 1930; Vol. 106, pp. 399–417.

Samples of field soil were taken at 2-hourly intervals. Fluctuations in bacterial numbers greatly exceeding the variation in bacterial content of simultaneous samples were found to occur by day and by night. To reduce sampling errors, a plot of soil was specially prepared and in soil from this plot significant fluctuations in bacterial numbers were found, greatly exceeding the variation between simultaneous samples. The maximum count usually occurred about 10 a.m. No correlation between the changes in bacterial numbers of soil moisture content was found; correlations of bacterial numbers with rainfall, soil temperature, and nitrate content of soil were doubtful. Results were examined statistically, and the methods of statistical analysis are given in full in the paper.

DU TOIT (M. M. S.) and PAGE (H. J.). **Studies on the Carbon and Nitrogen Cycles in the Soil. III. The formation of natural humic matter.** *J. Agric. Sci.*, 1930, **20**, 478–488.

Decomposition experiments in which soil extracts and nutrient salts were added to plant materials such as wheat straw, clover hay, maize cobs, and pine sawdust, and to purified preparations of plant constituents, including lignin, cellulose, xylan, xylose, potato starch, dextrose, and protein in the form of commercial blood fibrin, indicate that the formation of humic matter is more closely related to the change in lignin content of the original material than to the change in content of any other groups of plant constituents estimated.

ABERDEEN UNIVERSITY, SOILS AND DRAINAGE DEPT.

HENDRICK (J.). **A Soil Balance Sheet for a Rotation. Results obtained from the Craibstone Drain Gauges.** *Trans. Highl. Agric. Soc. Scot.*, 5th Series, Vol. xlii, 1930, pp. 1–27.

This paper gives a general account of the results obtained from the Craibstone Drain Gauges during a period of 10 years, 1919–1928. It includes the figures for the first complete rotation of crops upon the Drain Gauges, 1921 to 1926. The total amount of rain which fell upon the Drain Gauges and which passed through as drainage is given and also the amounts of Nitrogen, Phosphoric Acid, Potash and Lime which were applied to the soil as manures and brought down to it in the rain, and the total amounts removed in the drainage and in the crops are all tabulated. A Balance Sheet is then made up for the rotation showing what has been added to the soil as compared with what has been removed from it. The general results show that under the ordinary conditions of practice, where a soil is regularly cropped, little

nitrogen is lost in the drainage, no phosphoric acid is lost, but a moderate amount of potash and much lime are washed away. Except in the case of lime, far greater amounts of these materials are removed in the crops than are washed away in the drainage.

MACAULAY INSTITUTE FOR SOIL RESEARCH.

HART (R.). **Studies in the Geology and Mineralogy of Soils, Part II. Soils of South-East Scotland.** *J. Agric. Sci.*, Vol. 19, pp. 802–813, 1929.

The mineralogical analyses show that the soils have a varied content of silicate minerals, and in most cases the minerals are comparatively fresh, *i.e.*, only slightly chemically altered. The soils can be grouped according to the minerals present, and their grouping seems to depend on the geology of the parent material. The results also suggest that the composition of the matrix of the glacial drift (boulder clay) is largely influenced by local bedrock. The distribution and classification of the soils can be materially aided by mineralogical analysis.

OGG (W. G.). **Translation of the explanatory text accompanying the 1st General Map of the Soils of Europe.**

The text is arranged in four sections:—(1) Plan of the Map and list of collaborators. (2) Soils shown on the Map. (3) Preparation of the Map. (4) Description of the Map. The translation was undertaken at the request of Professor Stremme, Chairman of the Sub-Committee responsible for the preparation of the map, and copies of the map and text may be had on application to the Macaulay Institute for Soil Research, Aberdeen.

OGG (W. G.) and MACLEOD (A.). **Reclamation and Cultivation of Peat land in Lewis.** *Scott. J. Agric.*, 13 (2), pp. 121–133, 1930.

The island of Lewis has a dense rural population, but only 2·7 per cent. of arable land. Most of the island consists of moorland at low elevation. A peat demonstration farm has been established as part of a national soil research station. The peat is wet and very acid, and without phosphate, potash and nitrogen, growth is very poor. Shell sand is used as a source of calcium. The farm has been partially drained with wooden boxes and cultivated with a large rotary tiller. Various manures have been tried, and variety tests are being carried out with oats and grass seed mixtures. Organic manures have proved particularly useful on the raw peat and on mineral soils exposed by peat cutting.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

STEWART (W. LYLE). and THOMAS (BRYNMOR). **Phosphorus Poisoning in Sheep.** *J. R. A. V. C.*, Vol. 1, No. 1, Nov., 1929.

This article concerns an investigation into deaths which were occurring among sheep which were grazing over certain pastures forming part of an artillery practice range.

The enquiry showed the poisonous element to be elementary phosphorus derived from smoke shells. These shells, the active principle of which is phosphorus, are fired in considerable numbers on to this grazing, and if the total charge is not ignited, the residual phosphorus is scattered unexpended on the pasture, where it is eaten by sheep.

Chemical analysis showed the presence of phosphorus in the stomach and intestines of sheep, and the element, or its lower acids, was also detected on the pastures.

THOMAS (B.). **A Curious Case of Phosphorus Poisoning in Sheep.** *J. Min. Agric.*, Mar., 1930.

A non-technical account of the investigation referred to above.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

MCLEAN (W.). **The Carbon-Nitrogen Ratio of Soil Organic Matter.** *J. Agric. Sci.*, 1930, **20**, 348–354.

The carbon-nitrogen ratio has been determined for a range of British and overseas soils. Whilst there is a general tendency for this ratio to approximate to 10·5 : 1, considerable variations are encountered. High ratios are found for certain tropical soils. Comparing adjacent soils of differing fertility, there is some indication that the better soils have a higher carbon-nitrogen ratio. It is also shown that, comparing similar soils under the same treatment, the more fertile soils are richer in organic carbon.

ROBINSON (G. W.), HUGHES (D. O.) and JONES (BRYNMOR). **Soil Survey of Wales. Progress Report, 1927–29.** *Welsh J. Agric.*, 1930, Vol. 6, 249–265.

An account of soil survey work carried out in the following areas:— Gower Peninsula, West Glamorgan, Llangunnor district, Carmarthen, Newport-Cardiff coastal region, Bangor-Caernarvon district. Generalised maps of each area are given and the soils are classified into series and types. The geological formations represented are Cambrian, Ordovician, Old Red Sandstone and Carboniferous.

ROBINSON (G. W.). **Recent Advances in Pedology.** *Sci. Prog.*, 1930, **24**, 604–611.

A review of advances in the study of soils during 1929.

ROBINSON (G. W.) and MCLEAN (W.). **Note on the Occurrence of Elementary Carbon in Soils.** *J. Agric. Sci.*, 1930, **20**, 345–347.

The determination of organic carbon is frequently vitiated by the presence of fragments of coal and cinder. This is particularly the case with soils derived from the coal measures. It is shown that an approximate correction can be obtained by determining the proportion of carbon in the coarser fractions, using a factor to correct the carbon present in the fine fractions.

WILLIAMS (RICE). **Note on the Determination of Exchangeable Sodium in Soils.** *J. Agric. Sci.*, 1930, **20**, 355–358.

Exchangeable sodium may be determined with semi-normal acetic acid as a leaching agent, by the use of zinc uranyl acetate as a precipitating reagent. Details of the method are given, together with data for typical soils.

CAMBRIDGE UNIVERSITY.

TAYLOR (E. MCK.). **Base Exchange and its Bearing on the Formation of Coal and Petroleum.** *Proc. Geol. Soc. Lond.*, No 1201, June, 1929.

TAYLOR (E. MCK.). **A Comparison of the Conditions of Occurrence of Bituminous Coal and Petroleum.** *J. Inst. Petrol. Technol.*, XV, 372–384, 1929.

TAYLOR (E. McK.). **Base Exchange between Clay and Solutions of Sodium Salts and its relation to the Formation of Coal and Petroleum.** *Brit. Assoc. S. African Meeting. Reprinted in the S. African J. Sci.*, xxvi, Dec., 1929.

TAYLOR (E. McK.). **The Influence of Roof Conditions on the Bacterial Decomposition of Organic Matter with special reference to the Formation of Coal.** *J. Min. and Geol. Inst. India*, April, 1930.

HARPER ADAMS AGRICULTURAL COLLEGE.

DAVIES (W. MORLEY). **Liming in Shropshire.** *Harper Adams Agric. Coll. Bull.*, May, 1930.

The bulletin deals with (*a*) The relation of soil acidity to the soil types of Shropshire (*b*) The relation of crop growth to varying degrees of acidity, (*c*) The diagnoses of soil acidity and the determination of the amount of lime required. The pamphlet contains an explanatory acidity map of soils of the county. Specific information on the results of liming the Bridgnorth Series (very important series in the Midlands) is given. Corresponding to dressings of 0, 25, 50, 100 cwts. Carbonate of lime per acre, 11, 17½, 18½ and 20 cwts. barley (grain) were obtained.

SEALE-HAYNE AGRICULTURAL COLLEGE.

BLENKINSOP (A.). **A new volumetric method for the estimation of sodium.** *J. Agric. Sci.*, Vol. xx, pt. 4, pp. 511–516, Oct., 1930.

The method is particularly suited for the determination of Sodium in water, soil extracts, feeding stuffs, etc. It is separated from mixed solutions as a triple salt of sodium uranium zinc acetate, and the uranium in the latter reduced with Titanous chloride. The procedure for the removal of iron, aluminium and phosphoric acid (which are the only substances likely to interfere) is simple and effective. Very small quantities can be determined with accuracy by the method, which is suitable for rapid routine work.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

JONES (G. H. GETHIN). **A Study of the Pedogenic Processes in an Area of Lower Palaeozoic Shales.** *J. S.E. Agric. Coll.*, No. 27, pp. 229–251.

The area studied constitutes about 412 acres of an enclosed upland sheep walk on the farm of the University College of North Wales. Details of the chemical and mechanical analyses of the soil profiles are given and suggestions for the improvement of the grazing capacity are made.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

KHALIL (F.). **The effect of Drying on the Microbiological Processes in Soils.** *Zbl. Bakt.*, Abt. ii, Bd. 79, 1929, s. 93–107.

In certain arid regions, drying the soil by exposire to intense sunlight has been observed to increase its fertility. Drying reduces the bacterial content of the soil, but after re-moistening and incubation, dried soils show higher numbers than soils kept permanently moist. Drying also increases the nitrogen-fixing capacity of the soil and its ammonifying and nitrifying power. No evidence could be obtained in support of the view that drying increases the efficiency of the soil microflora. Drying, however, renders the soil organic matter more easily decomposable, and this may account for the observed beneficial effects upon ammonifying and nitrifying capacity, and upon the bacterial content of the soil.

(B) CROPS AND GENERAL BOTANY not classifiable under (C) to (K).

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.

HAWKES (F. C.). **Cereal Crops in Essex, 1927-28.** *J.N.I.A.B.*, Vol, ii., No. 3, 1930. 14 pp.

A report on records of the cereal crops grown by Essex farmers in 1927–8 collected by Mr. J. B. Gill, Secretary of the Essex Farmers' Union. The records cover from three to four per cent. of the total cereal area in Essex, and the report gives the yields, price and cash returns per acre of the principal varieties and deals also with the effect of differences in the soil and date of sowing. This report was also published in the Essex Farmers' Union Year-Book and a summary in the Journal of the Ministry of Agriculture.

PLANT BREEDING INSTITUTE, CAMBRIDGE UNIVERSITY.

ENGLEDOW (F. L.) and RAMIAH (K.) **Investigations on Yield in the Cereals. VII. A Study of Development and Yield of Wheat based upon Varietal Comparison.** *J. Agric. Sci.*, xx, April, 1930.

One of the gravest questions in corn growing in England is the "yield problem." This implies increase of output per acre, by any means possible, without substantially adding to cost of production. Increase may be sought on the one hand from improved growing practices. In this connection the external factors of yield must be studied and previously published papers have given evidence upon such factors as the seed drill and fertiliser action. Increase may be sought, on the other hand, from higher yielding varieties. Experience has shown that systematic breeding for intrinsically higher yielding capacity will demand an understanding of the factors or characters of the wheat plant by which yield is determined. Existing knowledge is not such as to enable us even to define, still less to measure, the true or ultimate "unit characters" of plants. Yield analysis can therefore be attempted only in terms of such gross morphological features as tillering, ear size, etc. These, however, are of considerable value if studied developmentally, i.e., throughout the life of the plant. They are only significant in relative terms, that is, when measured in one variety as compared with another.

A full comparison of Squarehead's Master, Yeoman and Rivet wheats was continued through four seasons. Crops were grown at different spacings on hand-dibbed experimental plots, under normal field conditions, and under extremely rough field conditions. In all years and under all conditions the varieties showed certain well-marked relative characteristics. These were studied in great detail, but only a few can be mentioned—and briefly—in this summary. Yeoman germinates, forms leaves, and tillers rather more rapidly than Squarehead's Master. Rivet in all these respects is very tardy. Later, in ear development, the varieties are sharply different and it is on this feature that yield per acre largely depends. Yeoman forms numerous ears, but these are somewhat small unless soil fertility and general conditions are good. It is, indeed, a "high farming" wheat. And the experiments show that intrinsically high yielding capacity, derived from carefully planned hybrids, i.e., combinations of plant characters, can bear full fruit only under high farming.

The complex effects of spacing on development and yield were studied in considerable detail. From some of the data light is cast upon the nature of soil heterogeneity and the influence of weather on crop development and

yield. The records of one of the seasons illustrate the nature and measure the effects of damage by wheat bulb fly (*Hylemyia coarctata*) and wheat midge (*Cecidomyia tritici et al*).

From the data of this and earlier studies of the series a chronological conspectus of the development of the wheat plant (as a crop) is compiled. It is intended to assist developmental studies of the action of parasites, of crop growing practices, and of the use of fertilisers.

ROTHAMSTED EXPERIMENTAL STATION.

BISHOP (L. R.). **The Nitrogen Content and "Quality" of Barley.** *J. Inst. Brew.*, 1930, Vol. xxxvi, pp. 352–364.

Soil and season are the most important factors governing yield and quality. Variety and artificial nitrogenous manures have less effect. It is suggested that the most important aspect of soil composition is the absence or presence of organic nitrogenous matter which is regarded as resulting in nitrification in summer with resultant high nitrogen grain.

These considerations and previously published statistical work on weather effects should guide anticipations of yield and quality of harvest.

After harvest judgment of yield and quality can be assisted by a knowledge of the nitrogen content and thousand corn weight from which can be predicted the "amount" of "extract" on malt and "permanently soluble" nitrogen in the wort.

BISHOP (L. R.). **The Prediction of Extract.** *J. Inst. Brew.*, 1930, Vol. xxxvi, pp. 421–434.

By a statistical study it is established beyond doubt that there is an immense relation between the nitrogen content of barley of one variety and the extract yield of the resulting malt. An increase of extract with increase of grain size is demonstrated almost as conclusively.

The practical use of these relations is discussed in assisting the valuation of barley and the control of malting operations.

BISHOP (L. R.). **The Proteins of Barley during Development and Storage and in the Mature Grain.** *J. Inst. Brew.*, 1930, vol. xxxvi, pp. 336–349.

The proteins of all varieties of barley behave in a similar regular manner. For each variety studied the proteins all increase regularly with the total nitrogen content and the percentage of hordein nitrogen increases regularly with increasing total nitrogen content the percentage of salt-soluble nitrogen decreases correspondingly while the percentage of glutelin nitrogen remains constant. The actual quantities of salt soluble nitrogen and glutelin nitrogen for any given total nitrogen content differ between different varieties which consequently are characterised by them. This applies only to mature grain. In immature grain the salt-soluble nitrogen is high and the glutelin nitrogen low, which has been found to occur when development is checked.

The formation of the separate proteins has been followed in barley grain as it develops on the plant and it is concluded that "Development of the proteins in the barley grain is essentially a synthesis of the simple compounds which enter it up to a definite equilibrium point controlled only by the total nitrogen content and the variety."

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

WHITEHEAD (T.). **Immature versus Mature Seed Potatoes.** *J. Min. Agric.* Aug., 1930.

Immaturity in seed tubers is known to confer a definite advantage, as a rule owing to their relative freedom from virus diseases. The value of

immaturity *qua* immaturity was, however, not known. In order to test this point, crops practically free from virus disease, on a seed farm where the diseases were known to spread very slowly, were selected, and immature and mature seed of two varieties were lifted in 1928, stored under identical conditions and planted alternately in eight replications in 1929. The results definitely established the fact that, apart from freedom in virus infection, there is no advantage to be gained by planting immature seed tubers.

BRISTOL UNIVERSITY.

LING (A. W.). **A Note on the Lifting of Sugar Beet.** *J. Min. Agric.* 1930 and *Internat. Sugar J.*, June, 1930.

The investigations described were carried out in order to ascertain whether there was any increase in the sugar content of sugar beet if, after lifting the roots, they were left in the field untopped for a few days prior to topping and carting to the factory. The results obtained indicate that under favourable climatic conditions beet that are treated in this way lost moisture, resulting in an increase in dry matter content. This results in a higher sugar content per beet, but the weight of sugar per acre is the same. It is doubtful whether this procedure is justifiable in practice on account of the additional handling of the beet which is necessarily involved.

LING (A. W.). **The Feeding Value of Pasture Grass.** *Hdbk. Somerset and W. Dorset Milk Rec. Soc.*, Apr., 1930.

The present position as regards the nutritive value of pasture grass and conditions affecting it is summarised. Reference is made to the Longleat Grazing Trials which are being conducted by the University and recommendations are made as to the treatment of grass land for best results in the light of present knowledge.

HARPER ADAMS AGRICULTURAL COLLEGE, NEWPORT, SALOP.

DAVIES (W. MORLEY) and DUDLEY (F. J.). **Experiments in the Cultivation of the Sugar Beet Crop in the West Midlands during 1929.** *J. Agric. Sci.*, Vol. xix, Pt. iv, Oct., 1929.

The results indicate that:—

(*a*) The yield of sugar beet increases with decreasing distances between the rows.

(*b*) The yield shows no similar change with variation of the distance (4 in., 6 in., 8 in. and 10 in.) between the plants in the row.

(*c*) Significant differences in yield are not apparent with variation of space per plant.

(*d*) There is no obvious relation between sugar content and spacing.

OXFORD UNIVERSITY.

CLARKE (G. R.), NEWMAN (L. F.) and LING (A. W.). **Recent investigations into Sugar Beet Problems.** *J. Min. Agric.*, Jan., 1930.

The paper is a record of investigations into (1) the possibility of storing beet in clamps and so allow the Sugar Beet Factories to deal with an increased acreage of beet, (2) the comparative accuracy of some standard analytical methods and (3) the rate of increase of sugar content and total weight of the beet crop during the growing season. The accuracy of some analytical methods under factory conditions has often been a source of irritation between the factory and the farmer, and it was thought desirable to carry out tests of the different methods.

Three advisory centres collaborated in the work on widely differing soils and under good and bad weather conditions, and the results are shown in the paper in tabular form, so that those interested in beet cultivation can obtain data from which to draw their own conclusions and to compare the total weight of beet with the rate of sugar storage.

(C) PLANT PHYSIOLOGY (including POMOLOGY).

LONG ASHTON FRUIT RESEARCH STATION.

GIBBS (M.) and SWARBRICK (T.). **The Time of Differentiation of the Flower-Bud of the Apple.** *Ann. Rep., Agric. and Hortic. Res. Stat., Long Ashton,* 1929, pp. 34–39.

This is a study of flower bud differentiation of Lane's Prince Albert apple at Long Ashton. Flower differentiation begins about the first week in July in spurs and a month later in the axillary buds on current year's wood. The development of flower parts was more rapid in the axillary buds so that at the end of the growing season all flower buds were in about the same stage of development. 1928 at Long Ashton was favourable for early flower bud formation. It is suggested that the period May-June is very important from a cultural standpoint and that the previous history and treatment of the trees should be given consideration in determining orchard practice.

HINTON (J. C.) and SWARBRICK (T.). **The Shape and Quality of Apples in Relation to their position in the Cluster.** *Ann. Rep. Agric. and Hortic. Res. Stat., Long Ashton,* 1929, pp. 67–72.

This is a study of the effect of position of fruit in the cluster upon the shape and the quality of the apple. Apples that develop from the terminal flower of the cluster are relatively elongated fruits, often tapering but slightly to the calyx end and then rounding off very abruptly and smoothly. The cavity is often completely obliterated and filled up with tissue, even to the extent of the production of a "beak." The fruit stalk is thick and fleshy and very short. These terminal fruits appear to have marked differences in quality from the lateral fruits even of the same cluster. They appear to keep longer but are less desirable fruits, particularly in the case of a variety like "Allington Pippin."

SWARBRICK (T.). **Root Regeneration upon Transplanted Apple Root-stocks.** *Ann. Rep. Agric. and Hortic. Res. Stat., Long Ashton,* 1929, pp. 40–46.

Data and observations are given of a study of the root regeneration upon rootstocks of the Malling Type XIII. These were transplanted on October 15th and were examined at approximately monthly intervals. Root regeneration began almost at once and was well established before the end of the year. The stocks were treated in two ways: (*a*) roots all removed upon transplanting and (*b*) all roots left intact. The former group began root regeneration first, but it was eventually more complete in the latter group.

SWARBRICK (T.). **Some Observations upon the Growth and Seasonal Cycle of Food Reserves in Apple Trees.** *Ann. Appl. Biol.*, Vol. xvii, 1930, p. 681–686.

A general account is given of the seasonal cycle of food reserves in the apple tree, and its relation to such growth characters as elongation, radial thickening and root growth, It is shown that flowering makes a very heavy demand upon starch reserves. Emphasis is laid upon the previous performance in determining orchard practice. The periodicity of root growth is discussed and it is shown that the main periods of root growth are in Spring before shoot growth and again in Autumn after shoot growth is over. The shape of leaves in relation to the internal condition of the tree is discussed.

Long narrow leaves are indicative of high carbohydrate or low nitrogen conditions, whereas broad short leaves indicate high water, high nitrogen and low carbohydrate.

SWARBRICK (T.). **Rootstock and Scion Relationship. Some Effects of Scion Variety upon the Rootstock.** *J. Pomol. and Hort. Sci.*, Vol. viii, 1930, pp. 210–228.

This article describes and cites a number of reported cases of effects of scion upon the rootstock. Some of them are as outstanding as the well-known effects of rootstock upon the scion. The material is collected together as a preliminary survey to the publication of the experimental work in progress upon these rootstock and scion relationships.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

AMOS (J.), HATTON (R. G.), HOBLYN (T. N.) and KNIGHT (R. C.). **The Effect of Scion on Root. II. Stem-Worked Apples.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 248–258.

An extension of previous experiments which has involved the morphological analysis of various combinations (stem-worked) of six commercial scion varieties and four rootstocks has revealed the following features :—

(1.) In the maiden year the total weight of roots was characteristic of the stock rather than of the scion, although subsequently the effect of scion on the total size of the root system may be more marked. Grenadier at two years old, for example, induces the formation of a larger root system than other varieties compared with it, and incidentally shows a relatively high ratio of root to shoot.

(2.) Other factors being equal, a large root system has a lower percentage of fibrous roots than a small one.

(3.) Consequently the use of different scions may indirectly affect the percentage of fibre on the root by altering the size of the whole system.

(4.) The differences thus produced are small in comparison with the differences between the root-systems when unworked, and therefore the latter still unmistakably exhibit their distinctive varietal characters irrespective of the influence of the scion variety.

(5.) Thus well-marked qualitative differences between the rootstocks are still present in stem-worked trees and are not obscured by scion influence.

HATTON (R. G.). **The Relationship between Scion and Rootstock, with Special Reference to the Tree Fruits.** Parts I and II, *J. R. Hort. Soc.*, 1930, 55, 171–209.

The behaviour of fruit trees on their own roots and the practice of working them in preference upon rootstocks are discussed.

The method of grafting on to the stock stem is contrasted with whole and piece root grafting. Scion rooting is often intentionally encouraged in the latter. Instances of variability of trees on seedling rootstocks and other causes of variability are cited. Trees on clonal layered stocks are compared. The possibilities of eliminating incompatibilities thereby are suggested. Attempts to obtain true lines from seed are quoted. A wider use of vegetatively propagated rootstocks is suggested. Causes of variability within the clone are discussed.

Evidence in favour of scion selection and bud variation is considered.

Experiments proving effect of rootstock upon scion are summarized. Numerical data are given illustrating special scion potentialities, stock peculiarities, modifications due to soil and subsoil type, and cultural treatments, such as manuring.

The less measurable but marked characteristics conveyed by rootstock to scion are emphasized, and shown to increase with age of trees.

Attempts to elucidate the cause of stock influence are reviewed. The effect of an intermediate scion is discussed in relation thereto. This appears to increase with the length of the intermediate.

The reciprocal effect of the scion upon the rootstock is considered and figures presented showing the minor modifications caused by the use of different scions worked upon the stems of layered rootstocks.

HATTON (R. G.) and ROGERS (W. S.), **The Importance of the Root System.** *Imperial Fruit Show leaflet, issued by the E.M.B.* (1929) *and J. Kent F.U*, 1929, **26**, 120–122.

The work here demonstrated shows how the grower after considering his soil, variety, purpose and other conditions can choose a rootstock for his trees which will give a definite standard of performance and help to attain his ultimate object. There is no best rootstock for all purposes, but the wide range available can suit a great variety of conditions. All tree fruits can be controlled in greater or less degree through the rootstock. Some aspects have already been reported on. Many aspects are still under detailed study at this Research Station, and queries and information on these matters are always welcome.

KNIGHT (R. C.). **Some Effects of Pruning "Leaders" and of the Absence of "Laterals" on the Rate of Growth of Stems of Apple and Plum.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 93–105.

The absence of lateral shoots on older stems had practically no influence on the rates of extension growth or of diameter increase of newly developing shoots.

Stems carrying no laterals show lower rates of diameter increase throughout the season than normally furnished stems. The lower region of the former grows more slowly than the upper region in the early part of the season, but later the position is reversed. In the "feathered" stems, the lower region grows as rapidly as the upper and much faster thereafter.

Measurements of plum trees have given results of a similar nature.

Although the new shoots of leader-pruned apples behave quite differently from those of unpruned trees, the increase in diameter of older stems of the former follows a course resembling that of older stems of "defeathered" trees.

The results provide some indication of the manner in which the previously recorded differences between furnished and unfurnished stems after a season's growth are arrived at, and show how the differences in the progress of the downward "wave" of cambial activity from newly developing shoots are reflected in the girth of older stems.

ROGERS (W. S.). **Root System and Tree Performance.** *Fruit Grower*, 1929, **68**, 646.

This article describes the East Malling Research Station Exhibit at the Imperial Fruit Show, 1929. The four ten-year-old Lane's Prince Albert trees shown demonstrate the wide range of vigour obtained by the use of different rootstocks. Rootstock effect on fruiting is also discussed. The excavated root systems of the trees, re-arranged in mid-air, demonstrate position and spread of root system. This far exceeds the branch spread. Manuring round the trunk is inefficient.

VYVYAN (M. C.). **The Effect of Scion on Root. III. Comparison of Stem- and Root-Worked Trees.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 259–282.

The distinctive characters of the root-systems of two year old No. II, and No. VI stocks remained approximately constant whether unworked, worked

with scions of their own variety or with Beauty of Bath or Grenadier and whether the latter were root-grafted on to piece roots or stem-grafted.

No. VIII worked with Beauty of Bath was likewise little affected by the method of working.

Root-systems of free seedling stocks failed to take on distinctive characters when worked with Beauty of Bath and Grenadier respectively whether or not a length of stock stem was left below the graft union.

Grenadier always gave a relatively larger root-stystem than Beauty of Bath and, in consequence, a smaller percentage of fibre.

WITT (A. W.). **Further Observations on Walnut Growing in England.** *J. R. Hort. Soc.*, 1930, **55**, 257–265.

Methods of propagation from seed and vegetative means are described in detail with indications of the measure of success obtained in rooting different species of Juglans by layering.

Methods of budding and grafting are described and the importance of proper selection of scion material is stressed.

Observations on pollination and susceptibility of different varieties to frost injury are recorded.

The possibility of multiplication by vegetative methods of outstandingly valuable Walnut trees for timber, is being explored.

RESEARCH INSTITUTE OF PLANT PHYSIOLOGY, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

ASHBY (E.). **Studies in the Inheritance of Physiological Characters. I. A Physiological Investigation of the Nature of Hybrid Vigour in Maize.** *Ann. Bot. Oxford*, xliv, 457–467, 1930.

A study was made in maize of the hybrid vigour of the first cross of two inbred parents. It was found that the hybrid does not differ from its more vigorous parent as regards relative growth rate or photosynthetic efficiency of the leaves. The only physiological difference observed was a greater initial weight of the embryo, and this gave the hybrid an advantage which was maintained throughout the grand period of growth.

JAMES (W. O.). **Studies of the Physiological Importance of the Mineral Elements in Plants. I. The relation of Potassium to the Properties and Functions of the Leaf.** *Ann. Bot. Oxford*, xliv, 173–198, 1930.

In the potato the number, area, weight, water content, rates of starch formation and translocation were examined in plots with and without potassium sulphate, potassium chloride and "potash manure salts." Starch formation per unit leaf area showed a significant increase in response to potassium, particularly to the sulphate. Senescence as indicated by the yellowing of the leaves was delayed by the addition of 1–2 cwt. per acre of potassium sulphate. A spotting ("coppering") of the young foliage was shown to be related to a deficiency of potassium.

TUBBS (F. R.). **Physiological Studies in Plant Nutrition. II. The Effect of Manurial Deficiency upon the Mechanical Strength of Barley Straw.** *Ann. Bot. Oxford*, xliv, 147–160, 1930.

An investigation of the effect of manurial deficiency on the strength of barley straw as measured by the weight required to crush 1 cm. of stem. The strength of succeeding internodes falls off rapidly. Deficiency of nitrogen and phosphorus causes a large increase in the strength of the lower internodes, while potassium deficiency decreases the strength of the lower and increases that of the middle internodes.

EXPERIMENTAL AND RESEARCH STATION, CHESHUNT.

SMALL (T.) and WHITE (H. L.). **Carbon Dioxide in Relation to Glasshouse Crops. Part IV. The Effect on Tomatoes of an enriched atmosphere maintained by means of a Stove.** *Ann. Appl. Biol.*, xvii, 1, pp. 81–89 (1930).

Increased yields were obtained from tomatoes grown in an atmosphere enriched with carbon dioxide by means of a portable stove burning special fuel. The increase was 16 per cent. in plants treated throughout the season and was 9 per cent. in plants treated for the first half of the season only. In the case of tomatoes grown in enriched atmospheres, the cultivation of two crops, planted January and June respectively, was not profitable under the experimental conditions. Data are given which show that mechanical mixing of the carbon dioxide and air is not essential from the standpoint of crop production. High concentrations of carbon dioxide occur in cucumber houses during the season. The concentration of carbon dioxide obtained from the fermentation of a mixture of tomato haulms and stable manure was insufficient to give an increased yield in tomatoes.

WHITE (H. L.). **Carbon Dioxide in Relation to Glasshouse Crops. Part V. An Analysis of the Response of the Tomato Crop to an atmosphere enriched with Carbon Dioxide.** *Ann. Appl. Biol.*, xvii, 4, pp. 755–766, 1930.

The effects include (1) shortening of the period between opening of the flower and picking the fruit, (2) higher percentage of flowers developing into fruit, (3) lower percentage of fruit retarded in ripening, (4) better development of the truss normally most poorly developed, (5) later development and ripening of the top crop, (6) bigger fruit at the end of the season.

The information obtained suggests that an increased concentration of carbon dioxide is most beneficial to the plant at periods of low fruit production.

ROTHAMSTED EXPERIMENTAL STATION.

CALDWELL (J.). **A Note on the Dichotomous Branching of the Main Stem of the Tomato** (*Lycopersicum esculentum*). *Ann. Bot. Oxford*, Vol. xliv, (clxxiv), 1930, pp. 495–498.

Occasionally in the experimental material it was noticed that plants appeared having dichotomously branched stems. One of these is described in this note. It is shown that the arrangement of the leaves indicates that the bifurcation is of the main stem and not axillary in origin. The stellar tissue divides exactly into two—one half going to each of the limits of the fork.

(D) PLANT BREEDING AND VARIETY TESTING.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

JENKIN (T. J.). **Perennial rye-grass at Aberystwyth.** *Welsh J. Agric.*, Vol. vi, pp. 140–165, Jan., 1930.

An account is given of results obtained with various "strains" of perennial rye-grass, studied partly under small plot conditions, but mainly as single plants. The "strains" include ordinary British Commercial, British Indigenous, "Once-grown" indigenous, some New Zealand lots, Norwegian "Jaedersk," as well as some others, including strains produced at the Welsh Plant Breeding Station. The points particularly studied were (*a*) yield, both in small plots and as single plants; (*b*) behaviour in the seedling year; (*c*) date of emergence of inflorescences in the first harvest year; (*d*) flowering stems in the aftermath and (*e*) stemminess of herbage. From these results conclusions are drawn in respect of the characteristics of the different "strains" or "nationalities."

JENKIN (T. J.). **Inheritance in *Lolium perenne* L. III. Base-colour factors, *C* and *R*.** *J. Genet.*, Vol. xxii, No. 3, pp. 389–394, July, 1930.

Two unrelated perennial rye-grass plants, on selfing, were found to give rise to both red-base and non-red seedlings. By outcrossing and inbreeding it was ascertained that in each case segregation was of the monohybrid type. Non-red plants of the two lines, when intercrossed, gave red-base plants, and in F_2 red-base and non-red seedlings were obtained in the ratio 9 : 7. Further breeding established the fact that two different basic factors, *C* and *R* are concerned with the development of red base-colour; in the absence of either, the plant is non-red.

JONES (E. T.). **Yellow fatuoid in oats.** *J. Hered.*, Vol. xxi, p. 81, Feb., 1930.

An elucidation and reference to the occurrence in oats of varieties in which yellow grain colour and fatuoid type of grain behave as compatible characters and of a variety, namely, Golden Rain, in which the yellow is practically completely suppressed whenever the grain is of the fatuoid type.

JONES (E. T.). **Morphological and genetical studies of fatuoid and other aberrant grain-types in *Avena*.** *J. Genet.*, Vol. xxiii, No. 1, pp. 1–70, Sept., 1930.

Brief descriptions are given of typical Series—A fatuoids, of slightly abnormal fatuoids, and of a sub-fatuoid and several semi-fatuoid types of oats which had been obtained in varieties of *A. sativa* and *A. sterilis culta*, or in the offspring of hybrids between these two species. The mutant forms showed simple segregation in relation to normal or cultivated type of grain, and simple allelomorphic behaviour one to another when intercrossed. Close association between fatuoid characters and low spikelet number was evident in the abnormal fatuoid strain. The genetical relationships of the "strong" and "weak" awns are considered. A review of the natural crossing, mutation and chromosome aberration hypotheses in relation to the fatuoid problem is given and the limitations of these hypotheses in relation to the new data introduced are critically discussed. A modified mutation hypothesis is presented of general application to the main fatuoid and related phenomena.

STAPLEDON (R. G.). **Nationality trials with cocksfoot and observations on the general bearing of the relationship of stem shoots to leaf shoots.** *Welsh J. Agric.*, Vol. vi, pp. 130–140, Jan., 1930.

Indigenous, New Zealand, Danish and French cocksfoot were compared under field conditions (hay and aftermath) over a period of four years. The New Zealand and indigenous strains are closely allied and are very different from Danish and French. In the first and second (and occasionally in the third) harvest years the Danish and the French are prone to yield more heavily than the New Zealand and indigenous, but subsequently the yields are reversed. The indigenous and New Zealand are the most leafy and winter-green strains.

STAPLEDON (R, G.) and THOMAS (M. T.). **Subterranean clover and winter killing.** *J. Min. Agric.*, Vol. xxxvi, No. 7, p. 616, Oct., 1929.

The importance of sowing date in relation to subterranean clover is again demonstrated.

The results under discussion endorse previous information that the most successful sowing dates in West Wales lie in the period from the middle to the end of June. There is also evidence that winter-killing is in direct proportion to degree of exposure and degree of heaviness of autumn-winter-early spring grazing.

The practical conclusion drawn is that subterranean clover is not suitable in districts subject to severe winters and that in districts with fairly mild winters the danger of winter-killing in exceptional years can be reduced by selecting sheltered fields and by sowing in a simple mixture and not grazing too hard during very cold periods.

STAPLEDON (R. G.) and DAVIES (WM.). **Experiments to test the yield and other properties of various species and strains of herbage plants under different methods of management.** *Welsh Plant Breed. Stat. Bull.*, Series H, No. 10, pp. 1–42, Jan., 1930.

The trials dealt with 22 species and strains of grasses and two mixtures. Yield, leafiness, persistency and other properties were investigated under three systems of management:—incremental cutting with a lawn mower grazing by sheep and taking hay and aftermath. The aggregate pasture yield for four harvest years of the indigenous strains surpassed the non-indigenous by 16 per cent. and in leaf yield by as much as 26 per cent. An interesting result has been the excellent preference of indigenous timothy as a leafy pasture grass.

STAPLEDON (R. G.) and MILTON (W. E. J.) **The effect of different cutting and manurial treatments on the tiller and root development of cocksfoot.** *Welsh J. Agric.*, Vol. vi, pp. 166-174, Jan., 1930.

This experiment was conducted on single widely spaced plants. Plants cut eight times to 6 in. considerably outyield those cut 10 times to ground level. All systems of cutting showed a decided response to nitrogen. Incremental dressings of nitrogen have been more pronounced on the yield of hay *cum* aftermath plants than on pasture plants. The continued plucking of inflorescences has given rise to a greater development of tillers and of roots than cutting as hay and aftermath.

THOMAS (M. T.). **Influence of date of sowing on the permanency of certain legumes as constituents of pastures.** *Welsh J. Agric.*, Vol. vi, p. 175, Jan., 1930.

An experiment was carried out to test the overwintering capabilities of certain species and strains of legumes.

Yellow suckling clover, subterranean clover and bird's foot trefoil were tested and evidence was obtained that date of sowing is an important factor if these species are intended for inclusion in seeds mixtures for permanent pastures.

It would appear that the annuals in the test need, for successful re-establishment, to be sown much later than bird's foot trefoil.

The annuals when sown prior to June flower and reseed in the year of sowing and the resultant seedlings are not strong enough by the autumn to overwinter. Sown at the optimum time July or early August they do not flower in the seeding year and the plants are robust enough to overwinter successfully, reseeding the following summer.

It is probable that these results help to some extent to explain why some species, although sown, do not make any appearance in the sward after the first year.

TINCKER (M. A. H.). **The effect of cutting to the ground level upon the growth of established plants of** *Dactylis glomerata* **and** *Phleum pratense*. *Welsh J. Agric.*, Vol. vi, p. 182, 1930.

Clones of grasses were raised to facilitate comparison of the increments of growth, as estimated by dry-weight and other determinations, made by established plants, cut at given intervals to ground level, with increments calculated from a synthetic growth curve obtained from uncut plants. Cutting at monthly intervals caused:—a reduction in the total seasonal produce of timothy and cocksfoot, a higher ratio leaf/stem, and a high moisture content in the new growth. The effect of cutting practised during one season was observed on the subsequent season's growth. The results (illustrated graphically) are related to the Station's agronomic work.

LONG ASHTON FRUIT RESEARCH STATION.

SPINKS (G. T.). **Self-Fertility and Self-Sterility in Cider Varieties of Apples.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

Records have been taken of the set of fruit obtained on self-pollinated and open-pollinated flowers of several cider varieties of apples over a period of four years. Open pollination was found to be almost always more effective than self-pollination. Results up to date indicate that Dabinett and Reinette Obry are definitely self-fertile, while Cherry Norman, Eggleton Styre, Sweet Alford and Strawberry Norman are self-sterile. Several other varieties were found to be slightly self-fertile. The order of blossoming is given in order to indicate suitable varieties for providing pollen for self-sterile trees.

SPINKS (G. T.). **Families of Strawberry Seedlings Bred for Resistance to Aphis.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

Several families of seedlings have been obtained by crossing or selfing varieties of strawberries resistant to aphis: the plants and fruits have been observed and a number of promising plants have been propagated for further trial. The largest proportion of good seedlings occurred in the families Tardive de Leopold × Royal Sovereign and Tardive de Leopold × Stirling Castle. In the first family almost all the plants were vigorous and resistant to aphis, but rather highly susceptible to mildew. In the second family the plants were also vigorous and resistant to aphis, while the great majority were also resistant to mildew. In both families about half the seedlings bore flowers which were pistillate only.

SPINKS (G. T.). **Progress Report on Fruit Breeding.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

Seedling plants of apples, pears, plums, black currants, raspberries, blackberries and strawberries have been kept under observation. Several

additional seedling varieties of apples, pears and plums have been selected for further trial, and in the case of apples and plums controlled crosses and self-pollination have produced a further supply of seed. A large trial plot of selected seedling varieties of black currants has been planted, while a second generation of plants has been obtained from a few selected seedlings. The majority of the hybrid Rubus seedlings have been found to be useless. A number of promising seedling strawberries have been selected, Tardive de Leopold being one of the parents in most cases.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.

ARMSTRONG (S. F.). **Trials of Spring-Sown Barleys, 1925-29.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930. 40 pp.

A final report on a series of variety trials extending from 1925 to 1929 of the varieties Plumage Archer 1924 (control), Archer-Goldthorpe, Spratt-Archer, Sunrise, Archer, Standwell, and three other varieties not on the market at Cambridge and six sub-stations in other parts of England. Tables of yield results and the values per acre at each station are given with a full commentary and review of the individual varieties and a report on the quality of the barleys from the Institute of Brewing. This report was also issued by the Institute as a separate publication.

BEAVEN (E. S.). **The Work of the Institute.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930. 4 pp.

This paper, read at the Eighth Annual General Meeting of the Fellows of the Institute, July, 1929, reviews the different aspects of the Institute's work and deals in particular with the contribution which variety trials of farm crops and especially cereals can make to the prosperity of agriculture. The paper concludes by stressing the importance of the ecological aspect of economic race distribution.

PARKER (W. H.). **Maturity and Yield Trials of Main Crop Potatoes, 1925-28.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930, 25 pp.

A final report on a series of variety trials extending from 1925 to 1928 of the varieties Ally, Arran Banner, Arran Chief, Arran Consul, Golden Wonder, Incomer, Kerr's Pink, King Edward, Majestic, Rhoderic Dhu, Tinwald Perfection, The Bishop, Field Marshal, Up-to-Date, and three varieties not on the market in Lancashire, Lincolnshire and Cornwall. Tables of total yield and yield of ware potatoes and tables of maturity are given with a full commentary and review of the individual varieties.

PARKER (W. H.) and BRYAN (H.). **Lord Derby Gold Medal Potato Trials, 1929.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930, 8 pp.

A report compiled for the Lord Derby Gold Medal Award Committee from trials at Ormskirk in 1929 of:—

(*a*) One new immune early variety, Pollock's D 1, against the standard varieties Arran Crest, Epicure, Ninetyfold and May Queen.

(*b*) Two new immune early main crop varieties, Alannah and Medland against the standard varieties Majestic, Great Scot and Kerr's Pink.

(*c*) One new immune late main crop variety, MacKelvie's No. 675 against the standard variety Golden Wonder.

The report deals with the yield and maturity of the varieties and announces that a certificate of merit was awarded to MacKelvie's 675.

THOMPSON (E. G.). **Trials of Spring-Sown Oats, 1925-28.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930. 11 pp.

A final report on a series of variety trials, extending from 1925 to 1928, of the varieties Abundance (control) Golden Rain, Victory, Thousand Dollar, Black Tartarian, and three varieties not on the market, at Cambridge and five Sub-stations in other parts of England. Tables of yield results, values per acre and proportion of husk are given with a full commentary and review of the individual varieties.

Report of the Potato Synonym Committee, 1929. *J.N.I.A.B.*, Vol. ii, No. 3, 1930, 7 pp.

The Committee, of which Dr. R. N. Salaman is Chairman, report upon the identity of potatoes entered for the 1929 Wart Disease Immunity Trials at the Potato Testing Station, Ormskirk, and record the proportion of synonyms among those entries and the prominence of synonyms in seedsmen's catalogues. There are tables of synonyms grouped under their types, and of distinct varieties free from or susceptible to wart disease.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

TYDEMAN (H. M.). **Some Results of Experiments in Breeding Black Currants. I. The Self Pollinated Families.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 106–128.

Details of observations extending over seven years, made upon seedlings of selfed families of the first and second generations of the chief varieties of black currants are summarised and discussed.

The behaviour of the seedlings with respect to the colour and form of the buds, season of leaf break and fruit maturity, length of the fruiting racemes, size and flavour of the fruits and texture of the fruit skin is dealt with. It is shown that the characters which were studied were transmitted without material modification to seedlings of the first and second generations.

It was found that, whereas Boskoop Giant, Goliath and Baldwin, when selfed, produced seedlings which bore leaves in all essential respects similar to those of the parent varieties, French Black and four closely allied varieties, produced, in addition to seedlings bearing leaves like the parent, a number which bore leaves of an abnormal shape. Seabrook's Black and Siberian, when selfed, gave rise to seedlings bearing two additional types of abnormal leaves as well as to bushes similar to those noted for French Black and bushes with leaves like those of the parent.

It is shown that none of these seedlings, with the possible exception of a small class segregating from varieties of the French group, gave rise to any new characters or combination of characters, of marked economic value.

ROTHAMSTED EXPERIMENTAL STATION.

FISHER (R. A.). **The evolution of dominance; reply to Professor Sewall Wright.** *Amer. Nat.*, lxiii, pp. 553–556, 1929.

The calculations which led Professor Sewall Wright to consider that the selective intensities available for the modification of dominance are insufficient to have brought about great results are, in a different notation, identical with those that originally led the author to attach importance to them. A slight mathematical error has, however, led Prof. Wright, in the special case chosen for examination, to the conclusion that the selective intensity starting from a low value decreases continuously, whereas, in reality, it increases in that case without limit. The conclusion that mutations have had time to become in many cases completely recessive can only be rejected by assuming that small selective intensities do not bring about effects proportional to

their magnitude. Although it is inevitably impossible to demonstrate extremely slow processes experimentally, yet there are general reasons for concluding that there is no such restriction upon such small selective intensities as Prof. Wright is obliged to postulate.

HUTCHINSON (J. B.). **The application of the "Method of Maximum Likelihood" to the estimation of linkage.** *Genetics*, Vol. 14, pp. 519–537, 1929.

The "Method of Maximum Likelihood" developed by Dr. R. A. Fisher is applied to the problem of estimating linkage in cases involving complementary and duplicate factors.

Variances are calculated for existing formulae, and their efficiencies are determined to show that the "Method of Maximum Likelihood" is in all cases superior to any other method of estimation.

The amount of information supplied per plant by Maximum Likelihood formulae for F_2s and backcrosses, and by other formulae for F_2s is calculated and compared with the amount of information supplied per plant by a simple —that is, completely classified—backcross. From figures 2, 3, and 4 of this paper it is possible to estimate the size of family necessary to give any required degree of accuracy.

SCOTTISH SOCIETY FOR RESEARCH IN PLANT BREEDING.

BLACK (W.). **Notes on the Progenies of Various Potato Hybrids.** *J. Genet.*, Vol. xxii, No. 1, Apr., 1930.

Various hybrid progenies are described and compared with references to several characters, viz. flowers (relative prolificness and colour), tuber colour, tuber flesh-colour, tuber shape, and eye depth.

It is suggested that the inheritance of tuber colour, part from pattern in the potato is, in several varieties, controlled by four factors D, R, P, H.

Genetic differences in apparently similar individual characters and the general complexity of constitution of varieties are discussed.

GREGOR (J. W.). **Experiments on the Genetics of Wild Populations. I.** *Plantago maritima* **L.** *J. Genet.*, Vol. xxii, No. 1, 1930.

Plants derived from a single area on the east coast of Scotland were studied. This locality, though limited in extent, was ecologically divided into two regions. Although the two habitats were not spatially isolated, population differentiation had occurred. Doubtless it is the sum total of genes which chiefly determine the presence or absence of a certain form in a certain habitat, yet it is possible that occasionally the phenotypic characteristic of growth-forms determine their survival, and some importance should be attached to the value of the several genotypes as represented by a particular phenotype.

GREGOR (J. W.) and SANSOME (F. W.). **Experiments on the Genetics of Wild Populations. II.** *Phleum pratense* **L. and the Hybrid** *P. pratense* L. × *P. alpinum* L. *J. Genet.*, Vol. xxii, No. 3.

Within the species *P. pratense* L. two intersterile groups of ecological significance have been identified. Within each a relationship exists between the growth-forms of a particular habitat and the environmental conditions of that habitat. The results indicate that a genetical-ecological grouping of organisms is of greater classificatory value than a system based entirely on morphological characters.

ROBB (WM.). **Annual Report for the year ended 31st March, 1930.**

CAMBRIDGE UNIVERSITY.

HANLEY (F.) and WOODMAN (R. M.). **The Effect of Sulphuric Acid Treatment on the Germination of Sugar Beet Seed.** *J. Soc. Chem. Ind.*, Vol. xlix, No. 19, May, 1930.

Experiments are described to determine the effect of sulphuric acid on the germination of sugar beet seed.

It is demonstrated that treatment of sugar beet seed with sulphuric acid of approximately 80 per cent. concentration leads to a statistically significant increase in germination under the conditions of the experiment.

Rate of germination also is found to be more rapid with acid-treated seed, suggesting that this treatment has useful possibilities in ensuring a quick and even "plant."

Results at the date of singling indicate that acid treatment leads to no reduction in the average dry weight of seedling, but rather the contrary.

No attempt is made to determine the sterilising effect, if any, of acid-treatment.

JOHN INNES HORTICULTURAL INSTITUTION.

CRANE (M. B.) and LAWRENCE (W. J. C.). **Fertility and Vigour in Apples in Relation to Chromosome Number.** *J. Genet.*, **22** (2): 153–163, May, 1930.

Odd number polyploids are relatively infertile, consequently in fruits such as *Rubus* and *Prunus*, where seed and fruit development are closely associated, triploid and other odd multiple forms are relatively unproductive. Triploid apples, however, are productive, e.g., Bramley's Seedling, a triploid is probably more widely cultivated in this country than any other apple.

In apples a very low proportion of fruit to flowers is sufficient to give a yield. The apple has ten embryos, and often a single seed is sufficient for the development of a fruit, and even this seed may be imperfect. Fruitfulness in apples is therefore maintained in spite of a high degree of generational sterility.

The "triploid" varieties of apples are themselves vigorous growers, but their offspring, whether derived from selfing, crossing *inter se* or crossing reciprocally with diploids, lack vigour, presumably owing to their aneuploid constitution. Consequently triploid varieties are likely to be of little value as parents in practical breeding as the necessary vigour and fertility will rarely be obtained in the seedlings.

DARLINGTON (C. D.). **Studies in Prunus III.** *J. Genet.*, **22**, (1): 65–93, 32 t.f.

Chromosome pairing is possible between a series of hybrids connecting *Prunus domestica* and *P. Amygdalus*. The origin of polyploid gametes is described.

DARLINGTON (C. D.). **Telosynapsis or structural hybridity in *Oenothera*?** *Nature*, **125**: 743, May 17th, 1930.

The hypothesis of telosynapsis in *Oenothera* is shown to be untenable.

DARLINGTON (C. D.). **A Cytological Demonstration of "Genetic" Crossing-Over.** *Proc. Roy. Soc. B*, **107** : 50–59, 12 figs. Oct., 1930.

Crossing-over is shown between chromosomes corresponding to "genetic" crossing-over, and is believed to be universal.

DARLINGTON (C. D.) and MOFFETT (A. A.). **Primary and Secondary Chromosome Balance in *Pyrus*.** *J. Genet.*, **22** (2): 130–151, 41 t.f., 1 plate, May, 1930.

The apple chromosome set of 17 is shown to be a compound with a real basic number of 7, the 17 set being made up of 3 repetitions of 3 chromosomes and 2 repetitions of 4 chromosomes of the fundamental set of 7. This derived polyploidy of the apple goes to explain why factors like colour are not inherited on simple mendelian lines.

GAIRDNER (A. E.) and DARLINGTON (C, D.). **Structural Variation in the chromosomes of** *Campanula persicifolia*. *Nature*, **125**: 87 (Jan., 1930).

Associations of more than two chromosomes in rings are described, in material from various wild localities.

GAIRDNER (A. E.) and HALDANE (J. B. S.). **A Case of Balanced Lethal Factors in** *Antirrhinum majus*. *J. Genet.*, **21**, 315–325.

Two factors are described affecting leaf colour in *Antirrhinum majus*, which are lethal when homozygous. These factors are linked with about 10 per cent. of crossing-over.

HALDANE (J. B. S.). **The Principles of Plant Breeding, illustrated by the Chinese Primrose.** *Roy. Instit.* (Feb., 1930).

A popular account based on the results obtained in breeding *Primula sinensis* at the John Innes Horticultural Institution.

HALDANE (J. B. S.). **A note on Fisher's theory of dominance, and on a correlation between dominance and linkage.** *Amer. Nat.*, **64**: 87–90, (Jan.–Feb., 1930).

HALDANE (J. B. S.). **Theoretical Genetics of Autopolyploids.** *J. Genet.*, **22** (3): 359–372, July, 1930.

The gametic series to be expected from various types of heterozygous autopolyploids are given, and the effects of self-fertilisation and random mating on populations are considered.

NEWTON (the late W. C. F.). **The Inheritance of Flower Colour in** *Papaver Rhoeas* **and Related Forms.** *J. Genet.*, **21**, 389–404.

Seven pairs of factors affecting flower colour have been studied, of which six fall into two linkage groups, three in each.

NEWTON (the late W. C. F.) and DARLINGTON (C. D.). *Fritillaria Meleagris*: **Chiasma distribution and frequency.** 9 t.f. *J. Genet.*, **22** (1): 1–14, April, 1930.

Chromosome pairing in *Fritillaria Meleagris* is shown to be a modification of that generally found in other organisms.

(E) SEEDS AND WEEDS.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

STAPLEDON (R. G.). **Modern Seed Testing.** *Sci. Prog.*, Vol. xxiv, No. 96, pp. 623–642, Apr., 1930.

The occurrences which led up to the foundation of an Official Seed Testing Station for England and Wales and to placing the Seeds Act on the Statute Book are briefly reviewed.

The question of uniformity in seed testing is dealt with, and current views held as to the definition of "pure seed" are discussed.

A distinction is made between reports that are necessary for legal purposes and those which are desirable from an advisory point of view, and suggestions are made as to the lines of research which should be followed with a view to making advisory reports of the greatest possible value.

WILLIAMS (R. D.). **Factors affecting seed production of red clover.** *Welsh Plant Breed. Stat. Bull.*, Series H. No. 11. Seasons 1921–1929. Pp. 60–91, 1930.

The rate of development of red clover seed varied according to the time of year. Seeds of flowers pollinated during the later half of July were fully ripe in 34 to 38 days.

Best quality seeds were obtained from heads in which the calyces were completely brown and upper part of stems yellow green. It is computed that even under optimum conditions only about 50 to 60 per cent. of the heads harvested produced seed of commercial value.

The proportion of "hard" to germinable seeds varied widely in different plants. In the case of plants harvested in one year, the proportion ranged from 12·6 to 70·4 per cent. Within the same plant the good quality seeds had a much higher proportion of hard seeds than the poor seeds.

The inter-relationships between various seed characters, such as weight, colour, hardness and germination, were investigated.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.

EASTHAM (A.). **Eleventh Annual Report of the Official Seed Testing Station for England and Wales.** *J.N.I.A.B.*, Vol. ii, No. 3, 1930, 18 pp.

A review of the work carried out by the Seed Testing Station between August, 1927, and July, 1928. Tables show the number of samples received and distribution according to species, the germination and incidence of seed-borne diseases in cereals, the distribution of cereal samples according to variety, the germination of pulses and root and vegetable crops, purity and germination of grasses and clovers, and the occurrence of dodder in clover samples. The principal features of these figures are discussed and compared with the results of previous years. An Appendix to the report reproduces the papers set in the Seed Testing Examinations held at the Station in 1928 and 1929.

SEED TESTING AND PLANT DISEASE DIVISION, MINISTRY OF AGRICULTURE, NORTHERN IRELAND.

MERCER (S. P.). **Sampling of Seeds.** *Actes du Viéme Congrés de l' Assoc. Internat. d'éssais de sémence.* Rome, 1929.

Results obtained by seven several methods of mixing were examined statistically for four different types of bi-specific mixture. The smallest

standard deviation was obtained by pouring the sample in contiguous narrow strips from a shovel at a rate allowing each strip to be traversed thrice each time the sample was poured, and performing the whole operation three times. A mixture whose constituents approached the proportion 50 : 50 proved easier to homogenize than one approaching 95 : 5. The size of sample used officially in Britain appeared just sufficient for accuracy. Wide discrepancies between the results of duplicates did not connote error of average, nor similarity of duplicate tests accuracy.

MERCER (S. P.). **The Ryegrass Seed Industry of Northern Ireland.** *Agric. Prog.*, Vol. 6, 1929.

In the main this paper is devoted to a description of the methods used in Northern Ireland in producing and marketing ryegrass seed. To this is added a short notice on enquiries concerning difficulties in practice. Ripe ryegrass can gain or lose 7 or 8 per cent. of its weight by absorption and exhalation of moisture in the course of a few days. This capacity to absorb moisture from a leaden atmosphere together with the high temperatures met with during shipment through tropical waters has been found to result upon occasion in serious loss of germination.

Experiments in early cutting have shown no diminution in germination capacity when perennial or Italian ryegrass is harvested a week or ten days prior to normal harvest.

MERCER (S. P.) and LINEHAM (P. A.). **Experiments upon the value of filtered ultra-violet light for diagnosis of *Lolium* species.** *Seed Analysts' Bull.*, Sept., 1930.

Tests carried out on some six thousand seeds from samples described as Italian and as perennial ryegrass by germination on white Whatman filter paper, and subsequent examination of the paper under filtered ultra-violet light have shown that Italian ryegrass seedlings cause the development of brilliant blue fluorescent streaks on the filter paper where the roots have lain.

Awnless ryegrass seeds in general do not produce fluorescence, but in many samples a small proportion do. These are referable to three classes, (1) true Italian seeds having lost their awns, (2) hybrids or segregants between the two varieties, (3) possibly, occasionally true perennials depart from the general rule. Awned seeds showed fluorescence in 100 per cent. of cases; awnless seeds from Italian samples in 91 per cent. of cases; awnless seeds from perennial samples in 10 per cent. of cases.

BRISTOL UNIVERSITY.

LING (A. W.) and PRICE (W. T.). **The Eradication of Slender Foxtail.** *J. Min. Agric.*, Jan., 1930.

Slender foxtail (*Alopecurus Agrestis* L.) is a very noxious weed of arable land in Great Britain particularly in corn crops and the experiments described were initiated in order to ascertain the best method of eradication. Apart from the usual precautions, such as the use of clean seed corn, keeping headlands free from weeds, the experiments demonstrated the desirability of skim-cultivating the corn stubbles immediately after harvest and delaying the preparatory cultivations for the winter sown corn crop as long as possible within practical limits. Germination of the weed seeds in the early autumn should be encouraged and the young plants killed by subsequent cultivation. Top-dressing in the early spring, particularly with calcium cyanamide, was found to be very effective. The seed of slender foxtail is not killed by deep ploughing; in fact it was found to be quite fertile after having been buried in the soil at a depth of 9 inches for two years.

(F) HORTICULTURE, FLOWERS, BEES.

LONG ASHTON FRUIT RESEARCH STATION.

BARKER (B. T. P.). **The Fruit Tree Complex in relation to Environment.** *Paper read before Intern. Hort. Conf.*, Aug. 13th, 1930.

A brief review of the main problems of fruit culture under investigation at Long Ashton, presented to the Conference as a preliminary introduction to its visit to the Station. The account of the investigations is treated chiefly from the point of view of the influence of the various environmental factors on the behaviour of fruit trees and on fruit quality.

ROTHAMSTED EXPERIMENTAL STATION.

MORLAND (D. M. T.) **On the Causes of Swarming in the Honey Bee (*Apis mellifera*): An Examination of the Brood Food Theory.** *Ann. Appl. Biol.*, Feb., 1930, Vol. xvii, pp. 137–149, with 3 text-figs.

The influence of nitrogenous food is discussed in its bearing on the question of swarming and theories of the origin of the brood-food are examined. The division of labour among bees of various ages is considered in its relation to the brood-rearing cycle. A critical surplus of nurse bees is found to be associated with the formation of queen cells in preparation for swarming and in this connexion swarm control measures are reviewed and also in relation to the brood-food theory.

(G) PLANT PATHOLOGY
(not classifiable under H, J and K).

HORTICULTURAL RESEARCH STATION, CAMBRIDGE UNIVERSITY.

TOMKINS (R. G.) and WOODMAN (R. M.). **Stalk Treatment of Fruit and Vegetables for the Prevention of Stalk Rot, with Special Reference to Bananas.** *J. Soc. Chem. Ind.*, Vol. xlix, No. 26, June, 1930.

As the result of a number of trials of various substances for stem end treatment for the prevention of stalk rot, the use of paraffin wax or vaseline is recommended.

TOMKINS (R. G.) and WOODMAN (R. M.). **Improved Method of Preventing Stalk Rot in Fruit.** (Provisional Patent, 7466 (7th March, 1930).) *Paper in Preparation.*

(H) ENTOMOLOGY.

LONG ASHTON FRUIT RESEARCH STATION.

GAUT (R. C.) and WALTON (C. L.). **Ox Warble Fly. Report on the Demonstrations and Experiments carried out in Worcestershire in 1928 and 1929.** *Worc. C.C. Agric. Educ. Sub-Cttee. Dept. of Agric. Educ.*, Worcester, Oct., 1929, pp. 1–26.

Following some initial experiments in 1928, a considerable series of field trials was conducted in the county during 1929 for the control of *Hypoderma bovis* and *H. lineata*, the Ox Warble Flies. The materials used comprised an Iodoform Ointment; a Pyrethrum + Rape Oil preparation; a Derris + Soap Wash, and three proprietary preparations. Sixteen herds were included, totalling 311 cattle. Four applications were made (five in 2 cases only) and records were kept and "control" animals examined throughout. Strikingly successful controls were effected by means of the Derris wash, which also proved to be cheap to make and easy to apply and was undoubtedly for general purposes the most satisfactory of the methods tried.

STANILAND (L. N.), TUTIN (F.) and WALTON (C. L.). **Investigations on Egg-Killing Washes at the Long Ashton Research Station.** *J. Pomol. and Hort. Sci.*, vol. viii, No. 2, May, 1930.

The paper is a complete review of the whole of the work on egg-killing washes carried out at this Station.

STANILAND (L. N.) and UMPLEBY (E.). **The Control of the Red Bud Borer.** *J. Min. Agric.*, Apl., 1930.

The experiments described show that attacks of the Cecidomyid fly (*Thomasiniana oculiperda*) may be prevented on the rose and the apple by coating the buds thoroughly, immediately after tying, with ordinary vaseline. The percentage "take" of buds is not affected adversely and, whilst it is not certain that this percentage is increased, callus formation is greatly stimulated.

STANILAND (L. N.) and WALTON (C. L.). **The Long Ashton Tar-Distillate Wash: Field Trials, 1929, II.** *J. Min. Agric.*, Oct., 1929.

This paper gives the results obtained by the use of the Long Ashton tar-distillate wash against the eggs of the apple Capsid Bug (*P. rugicollis*). The results in this, the second part of the paper, are concerned with counts made on mature fruit.

STANILAND (L. N.) and WALTON (C. L.). **Experiments on the Control of Pear Midge** (*Contarinia pyrivora*). **Progress Report.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton*, 1929.

A brief life-history of the pest is given. Experiments with various possible attractants are described and it is shown that Nitrobenzene and Clove Oil were each capable of attracting the midges. Experiments with Calcium Cyanide, tar-distillate washes, nicotine sprays and the removal of soil are described. Calcium Cyanide soil treatment at as low a rate as ½ oz. per sq. yd. effected complete control in the case of light garden soils. Nicotine and soft soap applied to the open blossoms effected a marked reduction in attack. The removal of soil from beneath affected trees, to a depth of 4 inches, resulted in a control of the midge. Tar oil washes applied to grass orchards failed to control the pest.

STANILAND (L. N.)and WALTON (C. L.). **The Control of Capsid Bugs on Black Currants.** *J. Min. Agric.*, Aug., 1930.

The preparation of a winter wash from a mixture of high boiling neutral tar oil and a heavy paraffin oil is described. When used at 10 per cent. strength on black currant bushes it has effected a practically complete control of Capsid Bugs (*P. rugicollis* and *L. pabulinus*).

TUTIN (F.) **Examination of Plants for Insecticidal Principle. I.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton,* 1929, p. 96.

Oenanthe Crocata.—It was shown that the toxic principle known to be present in the tubers of *Oenanthe crocata* may be extracted by means of petroleum, and is capable of being used for the destruction of insects.

Inula Disenterica.—The flowers of *Inula disenterica* were thoroughly examined, but no insecticidal principle could be obtained from them.

TUTIN (F.). **Further Observations on a Pyrethrum Spray Fluid.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton,* 1929, p. 93.

A spray fluid containing the active principles of Pyrethrum flowers was described in the Report for 1928. Further field trials with this preparation have given satisfactory results, notably against the Loganberry Beetle. Further investigation has shown that the entire active principles of Pyrethrum flowers may be extracted by petroleum. Aqueous extracts of the flowers are inert.

WALTON (C. L.). **The Raspberry and Loganberry Beetle and its Control. Some Experiments with a Pyrethrum Emulsion Spray.** *J. Pomol. and Hort. Sci.*, viii, 2, May, 1930, pp. 173–183.

Following a short review of previous work on the habits of and the injuries caused by *Byturus tomentosus*, a résumé is given of previous control experiments.

After a brief summary of some initial work with Pyrethrum sprays, an account is given of preliminary field trials carried out during 1927, the favourable indications of which led to much more extensive field trials in 1929.

These were conducted chiefly on raspberries, but also on loganberries, and confirmed the promising results previously gained, a reduction in infestation as high as 49·86 per cent. in the case of raspberry, and of 55·26 per cent. in the case of loganberry being obtained.

WALTON (C. L.) and STANILAND (L. N.). **The Common Green Capsid Bug (*Lygus pabulinus*) as a Pest of Sugar Beet.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton,* 1929.

The Common Green Capsid Bug may become in future a factor of some importance in the economics of sugar beet growing. The type of plant produced as the result is described and figured, and a note is included on the satisfactory treatment of the field with nicotine dust.

HORTICULTURAL RESEARCH STATION, CAMBRIDGE UNIVERSITY.

WOODMAN (R. M.). **Wetting, Spreading and Emulsifying Agents for Use with Spray Fluids. I. Wetters and Spreaders.** *J. Soc. Chem. Ind.*, **49**, 93T–98T (1930).

A laboratory examination of several well-known and possible wetters and spreaders is made, the tension solution/air being measured; drawbacks to this method of estimating the wetting and spreading powers of a solution are pointed out.

Examples are given which show that traces of liquids may act as wetters and spreaders.

Methods of conferring the properties of wetting and spreading other than by lowering the tension spray fluid/air are advocated to some extent.

WOODMAN (R. M.). **Wetting, Spreading and Emulsifying Agents for Use with Spray Fluids. II. Emulsifiers.** *J. Soc. Chem. Ind.*, **49**, 193T, 1930.

The rules to be obeyed by an emulsifier used in the preparation of spraying emulsions for insecticidal purposes are discussed.

The influence of hard and pseudo-hard waters on certain emulsifiers is demonstrated; results are given for the emulsification of oils, embracing all the known types used as spraying oils, by various emulsifiers.

Oil solutions of naphthalene and mixtures of oils of possible horticultural value have been emulsified.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

MASSEE (A. M.). **The Strawberry Red Spider.** *Gard. Chron.* (1929), **86**, 310–311.

Brief notes on the habits of the Strawberry Red Spider (*Tetranychus telarius* L.) are given, and it is pointed out that this mite may cause considerable damage to strawberry plants in seasons favourable for the breeding of the mite.

MASSEE (A. M.). **Notes on Insect Pests.** *Gard. Chron.*, 1929, **86**, 507–508.

A short note pointing out that the eggs of many important insect pests were unusually common on fruit trees during the winter of 1929–30.

The effect of weather on insect pests is also discussed.

MASSEE (A. M.). **The Occurrence of a Tarsonemid Mite upon the Cultivated Strawberry in England.** *Gard. Chron.*, 1930, **87**, 110–111.

The Mite, *Tarsonemus fragariae*, Zimm., is recorded as a pest upon the cultivated strawberry in England for the first time.

Mention is made of the occurrence of this mite in Europe, together with details of damage caused to the plant.

Notes on the habits of the mite are also outlined.

MASSEE (A. M.). **The Strawberry Red Spider.** *Gard. Chron.*, 1930, **87**, 335.

The hibernation period of the strawberry red spider is discussed, and it is shown that most of the mites spend the winter in the adult state, sheltering in the crowns of the plants, amongst dead leaves and in the soil.

MASSEE (A. M.). **The Control of the Fruit Tree Red Spider on Plum.** *E. Malling Ann. Rep.*, 1929. (April, 1930) (I. General), 85–88; *Reptd. in J. Kent F.U.*, 1930, **27**, 222–224.

It has been shown that wherever tar-distillate washes are used, there is a tendency for the Fruit Tree Red Spider to increase and become a pest of economic importance.

It is pointed out that tar-distillate must still be used in order to destroy other important pests of the plum.

The Fruit Tree Red Spider can be controlled by spraying the plum during the growing season, about two weeks after the blossoms have fallen, with a lime-sulphur spray at the rate of 1 gallon of lime-sulphur to 99 gallons of water.

The lime-sulphur spray does not reduce the crop or cause any spray injury.

White Oil emulsion (1 per cent.) and Bordeaux Mixture (8: 12: 100) do not control the mite at the strengths used in this experiment.

MASSEE (A. M.). **The Apple Blossom Weevil: The Results of Further Investigations upon its Control.** *E. Malling Ann. Rep.*, 1929 (April, 1930) (I. General), 89–93. *Reptd. in J. Kent F. U.*, 1930, **27**, 182–183.

It is shown that corrugated cardboard bands are more successful than "sack bands" for trapping the Apple Blossom Weevil; and that strips of old carpet felt also prove to be superior to the "sack bands" when tested under similar conditions.

In addition it is pointed out that the corrugated cardboard bands are much easier to put on the trees as compared with the "sack bands."

A new method of destroying the Weevil whilst hibernating in the sack band is described. It has been found that the weevils can be killed by spraying the bands *in situ* on the trees by means of a 10 per cent. tar-distillate wash.

In addition those weevils hibernating on the trunk immediately beneath the bands are destroyed also.

Finally, the weevils hibernating under loose bark, and those hiding in the sackings which is placed around the tree trunks to prevent rubbing and damage by the string of staked trees are also killed by the winter wash.

MASSEE (A. M.). **The Control of the Fruit Tree Red Spider** (*Oligonychus ulmi* C. L. Koch) **of Plum During the Growing Season.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 184–194.

It is pointed out that the Fruit Tree Red Spider (*Oligonychus ulmi* C. L. Koch) is a very serious pest of plum in this Country, and that this mite occurs very commonly in orchards which have been sprayed during the dormant season with a tar-distillate winter wash.

It is further demonstrated that it is essential to continue using the tar-distillate washes in spite of the fact that the Fruit Tree Red Spider is not controlled by these sprays. Other important pests and diseases such as the Plum Aphides, the Winter Moth and Brown Rot, are controlled as a result of tar-distillate spraying.

That the Fruit Tree Red Spider can be controlled by spraying the plum trees during the growing season, about two weeks after the blossoms have fallen, with a lime-sulphur spray.

That spray should be applied at the rate of one part of lime-sulphur to 99 parts of water.

That the lime-sulphur spray does not reduce the crop, or cause any form of injury to the foliage or fruits.

That White Oil Emulsion (1 per cent.) and Bordeaux Mixture (8: 12: 100) are not toxic to the mites at the strengths used.

MASSEE (A. M.). **On a New Sub-Species of Eriothyid Mite on Plum.** *Ann. and Mag. Nat. Hist.*, 1930, **6**, 145–148.

A systematic description of a new sub-species of Gall Mite (*Eriophyes similis prunianus*, Subspn.) is given. A description of the Plum Gall Mite (*Eriophyes similis* Nal.) is also appended.

MASSEE (A. M.). **On Some Species of Gall Mites** (*Eriophyidae*) **found on** *Corylus avellana*, **L.** *Bull. Entom. Res.*, 1930, **21**, 165–168.

Systematic descriptions of four species of Nut Gall Mites which occur in this country are given.

An account is also given of the Nut Gall Mite destroying the female flowers and catkins of cultivated nuts.

Massee (A. M.). **The Fauna of the Weevil "Sack Band." I.** *Ann. and Mag. Nat. Hist.*, 1930, **6**, 317–320.

A list of the commoner insects, mites, etc., noted in the weevil "sack band" traps, together with a few details of other pests found in the bands.

Massee (A. M.). **The Relative Value of Tar-Distillate Washes, Spring Washes and Grease-Banding in any Scheme of Insect Control.** *J. Kent F.U.*, 1930, **28**, 98–104.

Among the more important features brought forward in this paper the following are of interest:—

A list is given of important insect pests of fruit controlled by tar-distillate washes. The most economic strength of spray to use, and the critical time for applying the wash to various kinds of fruit trees is also discussed.

In addition, the insects not affected by, and those only partly controlled by tar-distillates are reviewed.

It is also emphasised that spring washes must be used in addition to tar-distillates when certain insect pests are present.

Finally, it is explained that greasebanding is still to be recommended in certain cases for the control of March and Winter Moth and also for the control of Apple Capsid in conjunction with a nicotine spray.

Massee (A. M.) and Beshir (M.). **The Control of the Apple Blossom Weevil.** *J. Min. Agric.*, 1930, **37**, 164–171.

It is demonstrated that corrugated cardboard bands may be used instead of, and in preference to, "sack bands" for trapping Apple Blossom Weevils.

Strips of carpet felt also proved to be superior to the "sack band" when tested under similar conditions.

A new method of destroying the weevil whilst hibernating in the "sack band" is described.

It is shown that the Weevils can be killed by spraying the bands *in situ* on the trees with a 10 per cent. Tar-distillate wash.

It is found also that the weevils hibernating on the trunks immediately beneath the bands are destroyed by the wash.

Steer (W.). **The Red Plum Maggot.** *The Fruitgrower.* 1930, **69**, 1779.

The damage done by the Red Plum Maggot to various varieties of plums, damsons and peaches, and the various known stages of the insect are briefly described. Such facts as are available concerning its habits and life history are reviewed.

It is noted that some of the larvae pupate under sacking bands tied around the trunks, and it is suggested that these might be killed by ensuring that such bands are soaked by a tar-distillate wash during the customary winter spraying operations.

Attention is drawn to the fact that many larvae are sent to the markets with the fruit, and it is just possible that some of these may pupate in the returnable baskets and so spread to new areas.

PLANT PATHOLOGICAL LABORATORY, MINISTRY OF AGRICULTURE AND FISHERIES.

FRYER (J. C. F.). **The Capsid Pests of Fruit Trees in England.** *4th Int. Cong. Entom. Ithaca, N.Y.*, 1928, ii (Trans.), pp. 227–236, 11 refs. Tring, England, 1929.

An account is given of the bionomics of *Plesiocoris rugicollis*, Fall. (apple Capsid) and *Lygus Pabulinus*, L. (common Capsid), two insects that have recently become serious pests of apple in England (cf. R.A.E., A, vi, 278; xvi, 619; etc.). Hypotheses are suggested to explain how these species, each with distinct feeding habits, became adapted to apple. The reaction of food-plants to attack, the tolerance of certain plants and the development of resistance in others are discussed. It has frequently been observed that trees in an orchard permanently covered by grass are less severely attacked by P. rugicollis than those grown in cultivated soil, and there is some ground for supposing that the hardier type of growth obtained in grass orchards is less suitable to the bugs both for feeding and oviposition. The present situation regarding the problem of spraying for the control of these pests is reviewed.

ROTHAMSTED EXPERIMENTAL STATION.

BARNES (H. F.). **On the Biology of Gall-Midges affecting Meadow Foxtail Grass.** *Ann. Appl. Biol.*, May, 1929, Vol. xvii, pp. 339-366.

Three midges do serious damage to the seeding of meadow foxtail grass; they are *Dasyneura alopecuri* (Reuter), *Stenodiplosis geniculati* Reuter and *Contarinia merceri* n. sp. All three occur almost wherever the grass is grown. "Blindness" or empty husks in meadow foxtail grass is due very largely to attacks of *C. merceri*, which midge does the most extended damage. Keys are given for the separation of larvae, pupae and adults. Control measures are discussed and a method of keeping sheep on the grass until a certain safety date, i.e., a date when the crest of emergence of the female midges is over, is strongly advocated in districts where the bionomics is known.

BARNES (H. F.). **On Some Factors Governing the Emergence of Gall-Midges.** *Proc. Zool. Soc.*, 1930, pp. 381–393.

The times of emergence of about 100,000 individual midges has been investigated under several environmental conditions, including those in which both light and temperature have been varied. The effect of extra heat, while causing earlier than normal emergence, decreases the percentage emergence, while that of extra cold is less marked. Hymenopterous parasites appear to be less affected by cold than their host midges. It is suggested that variation in the relative times of emergence of hosts and parasites, due to differential weather effects, causes sudden marked fluctuations in degree of parasitism.

BARNES (H. F.). **On the Resistance of Basket Willows to Button Gall Formation.** *Ann. Appl. Biol.*, xvii, Aug., 1930, pp. 638–640.

A preliminary account of experiments showing that different varieties of basket willow show different degrees of susceptibility to attack by the midge *Rhabdophaga heterobia*. Whereas the variety "Harrison" showed complete immunity from attack through three generations of the insect in question, five other varieties tested all proved to be heavily attacked.

Barnes (H. F.). **Gall-Midges as Enemies of Aphids.** *Bull. Entom. Res.*, Dec., 1929, Vol. xx, pp. 433–442.

An annotated catalogue of all species known to prey upon aphids. The host species are dealt with together with the principal literature.

Barnes (H. F.). **Unisexual Families in** *Rhabdophaga Heterobia.* *Entom. Mon. Mag.*, Nov., 1929, pp. 256–257.

Describes experimental observations showing that unisexual families occur in this midge. This feature is extremely rare among animals with bisexual reproduction, and the facts recorded are comparable with Metz's work dealing with various species of *Sciara*.

Edwards (E. E.). **On the Morphology of the Larva of** *Dorcus Parallelopipedus.* *J. Linn. Soc.*, Aug., 1930, pp. 93–108, with 7 text-figs.

Describes the detailed external morphology of this type and the salient features connected with the digestive and nervous systems. Apart from other characters the larva of *Dorcus* can be separated from those of other genera of European Lucanidae by the form and arrangement of the tubercles composing the coxal and trochanteric stridulatory areas. In its digestive system it exhibits affinities with the Scarabaeidae, while the nervous system is of a primitive type approaching that of *Lucanus*. The Malpighian Tubes are exceptional in that their distal extremities are confluent in pairs and assume, in consequence, a looped condition.

Imms (A. D.). **A General Textbook of Entomology.** Lond., Methuen & Co., March, 1930, 2nd Edition, 703 pp. and 607 illustrations, 36s.

This is revised and slightly extended on the first edition. A second American edition was published in New York during 1930. ($10.)

Imms (A. D.). **Observations on Some Parasites of** *Oscinella Frit.* **Part I.** *Parasitol.*, 1930, Vol. xxii, pp. 11–36, with 14 text figures.

Describes two years' observations and experiments with reference to the natural infestation of the stem generation of the frit fly by parasites. Four species of parasites were found to attack this host, one of which, *Callitula bicolor*, was previously unknown in this relation. Owing to these several species being little known, and in order to establish their identity as clearly as possible, detailed descriptions are provided and their morphological characteristics fully illustrated. During the two years in which the investigations were carried out the total destruction of frit fly in Harpenden plots by parasites amounted to 27 per cent. in 1926 and 37 per cent. in 1927. Evidence afforded by field plot experiments showed that the parasites, collectively, become more abundant as the season advances with the result that frit fly, affecting late sown oats, suffers markedly heavier mortality from parasites than when it attacks oats drilled earlier in the season.

Imms (A. D.). **Remarks on the Biological Control of Noxious Weeds.** *Proc. IVth Internat. Conf. of Entom., Ithaca*, Vol. II, Dec., 1929, pp. 10–17.

A discussion of the main principles of the subject and their application to practical problems. The subject of host-selection among phytophagous insects and the significance of changes of habit in this respect are dealt with in particular. An outline is given of the work carried out at the Rothamsted Station in connection with weed control problems in New Zealand. The rearing, testing and transmission to that country of insects affording promise of inhibiting the growth and spread of gorse, ragwort and blackberry are described.

BIOLOGICAL FIELD STATION, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY.

Munro (J. W.) and Thomson (W. S.). **Report on Insect Infestation of Stored Cacao.** *E.M.B. Rep.*, No. 24, 1929.

Richards (O. W.) and Herford (G. V. B.). **Insects found in association with Cacao, Spices and Dried Fruits in London Warehouses.** *Ann. Appl. Biol.*, xvii, No. 2, 1930.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

Gray (R. A. Harper) and Britten (A. G.). **Tar-Oil Spraying Trials in a Cumberland Nursery Orchard.** *Gard. Chron.*, 4th Jan., 1930.

These trials were carried out in the orchards of Mr. A. G. Britten, Cumberland, and were begun in 1926. The account contains practical observations made during the years 1926, 1927 and 1928, which should be of special interest to northern fruit growers. Primarily, the object of the trials was to find out the comparative values of various tar-distillate washes on insect life upon fruit trees, but notes were also made on the effects observed on strawberry plants, gooseberry and currant bushes, daffodils, and rhubarb grown underneath the trees.

The improvement in the condition of the trees as regards freedom, particularly from Aphis and Apple Sucker, as well as the consequent improvement of crop on many of the trees was very marked in 1928.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

Davies (W. Maldwyn). **The Warble Fly.** *Advisory Leaflet*, Jan., 1930.

This Advisory Leaflet was published in Welsh and English, and dealt in a general way with the damage caused by warbles, the species of fly concerned, the life history of the warble fly, and the treatment for this pest. The leaflet terminated in an appeal for combined action on the part of the farmers.

Davies (W. Maldwyn). **Parasitism in Relation to Pupation in *Lucilia sericata* Meig.** *Nature*, No. 3160, Vol. 125, pp. 779–780, May 24th, 1930.

Attention is drawn to the normal mode of hibernation in *Lucilia sericata* and to the fact that workers in France confirm this observation, but in certain instances they found hibernating *puparia*, instead of larvae. In these cases, however, it was shown that practically all puparia were parasitised. No hibernating *puparia* had been found in the writer's investigations, but this could be explained by the fact that the larvae used were obtained direct from living sheep, and it had been shown that such are not parasitised. This absence of parasitism by *Alysia manducator* among larvae obtained from the living host has an important bearing on the biological control of Sheep Blow Flies.

MANCHESTER UNIVERSITY.

Miles (H. W.). **The Chrysanthemum Midge, *Diarthronomyia hypogaea*.** *N.W. Nat.*, 1929, pp. 173–175.

In the autumn of 1928 an attack of the chrysanthemum midge, a scheduled pest, occurred near Manchester. The varieties of chrysanthemum most heavily infested were Baldock's Crimson, Madam B. Latour and J. J. Morrish. Golden Butterfly, White Pantra Ralli, Franfield Orange, Pink Pearl,

Gloriose, December Gold, Queen of the Pinks, Baldock's Bronze, Mrs. A. Cross and Uxbridge Pink were attacked to a less degree. The infestation of so wide a range of varieties suggests that the insect has no strong predilections amongst chrysanthemums. Control measures include spraying with nicotine (98 per cent.) at the rate of 2 oz. in 25 gallons of water, with soft soap to make a lather.

Miles (H. W.). **Slugs and Their Control.** *Gard. Yr. Bk.*, 1929.

An account is given of the slug species commonly occurring, the injury which they cause to the crops and control measures which have been found satisfactory. Control measures include garden hygiene, the use of artificial manures, trapping and the use of repellents.

Miles (H. W.). **The Frit Fly Problems in the North West of England.** *J. Roy. Lancs. Agric. Soc.*, 1930, pp. 1–11.

The frit fly has been studied under field conditions since 1927. The main swarming periods lag behind those of the south of England. Attack is usually severe on both tillers and grain, and a very definite association has been observed between the production of "blind" ears and frit fly attack at the base of the panicle. In 1929 tiller attack was as high as 25 per cent. and grain attack as high as 54 per cent. in individual cases. Distribution, varietal susceptibility and date of sowing in relation to attack, are also dealt with.

Miles (H. W.). **A New Phase of Injury by Cabbage Root Fly.** *Agric. Prog.*, 1930.

A description is given of injury to swedes in the North West of England by the larvae of the cabbage root fly, *Chortophila brassicae*. The eggs are laid about the leaf bases and the growing points of the swedes, and the larvae tunnel into the leaf stalks or into the neck of the swede. This initial injury is frequently followed by bacterial and other rots and results in serious losses amongst the crop.

MIDLAND AGRICULTURAL COLLEGE.

Roebuck (A.). **A New Pest on Celery.** *The Fruit Grower*, Oct. 7th, 1929.

An account of *Paraphaedon tumidulus* as a potential pest of celery and other Umbellifers. A number of outbreaks in Nottinghamshire, Derbyshire, and Lincolnshire during the last few years are cited.

Roebuck (A.). **The Flea Beetles which attack the Turnip and Cabbage Tribe.** *Derbyshire Farmer*, May, 1930.

A brief description of the various species and some account of their habits is given. Short accounts of the methods used in controlling them by seed dressings, catching adults, dusting and spraying are given.

Roebuck (A.). **Recent Progress in Agricultural Entomology.** *Agric. Prog.*, 1930.

An account of the more important results of research conducted all over the world in recent years. The results are classified under various group headings, such as Weather and Insects; Insects as transmitters of plant diseases; Non-spraying methods of control; Large scale control by aeroplanes; Chemical methods of Control; Biological control; etc.

ROEBUCK (A.). **Mustard Beetle Attack on Swedes.** *Farmer and Stock Breeder,* July 21st, 1930.

The migration of the Mustard Beetles from the Mustard stubbles to the swedes in late summer is described. The method of control by spraying is given.

ROEBUCK (A.). **Warble Flies and Cattle.** *Hull and Lincs. Times,* Mar. 29th, 1930. *Lincoln, Rutland and Stamford Mercury,* Apr. 4th, 1930. *Lincs. Chron. and Leader,* Apr. 5th, 1930. *Yorks. Post,* Apr. 19th, 1930.

A popular account of the Warble Fly and its development is given with an appeal for its eradication. The procedure in the treatment of the warbles with derris root powder is detailed.

OXFORD UNIVERSITY.

CUNLIFFE (N.). **Studies on *Oscinella Frit,* Linn. Comparative Records of Oat Grain infestation in Sweden during the year 1927, together with a note on Sterility or "Blindness" of Grain.** *Ann. Appl. Biol.,* Vol. xvii, No. 3, Aug., 1930.

Data, collected in Sweden during the year 1927, indicate the existence of considerable variation in extent of infestation of the grain of different varieties sown at the same time. Also they suggest that sterility or "blindness" of grain may be a varietal character.

SEALE HAYNE AGRICULTURAL COLLEGE.

HODSON (W. E. H.) and BEAUMONT (A.). **Sixth Annual Report of The Department of Plant Pathology,** *Seale Hayne Agric. Coll. Pamph.,* No. 31, 28 pp. Newton Abbot, Devon, 1930.

Full notes are given on pests occurring in Devon and Cornwall during the season 1928–29, together with a list of insects not recorded during the five previous years or occurring on plants not previously recorded. Short articles relate to work carried out or still in progress on pyrethrum growing, on the corn beetle, *Lema melanopa,* and on the cabbage whitefly, *Aleurodes brassicae.* Notes are given concerning the strawberry problems in the province. A fuller abstract of the publication is given in the *Review of Applied Entomology,* Series A., vol. xviii, Sept., 1930.

SOUTH EASTERN AGRICULTURAL COLLEGE, WYE.

AUSTIN (M. D.). **Oviposition of *Lygus pabulinus* Linn.** *Gard. Chron.* No. 2254, Vol. lxxxvii, p. 191, 3 figs., Mar., 1930.

The oviposition of *pabulinus* is fully described, a photo and two drawings supplementing the text. This technical description of both the oviposition and the ovipositing apparatus is the first full record of this aspect of the biology of this capsid.

AUSTIN (M. D.). **Capsid Damage to the Fruits of Red Currants.** *Gard. Chron.,* No. 2275, Vol. lxxxviii, p. 94, 3 figs., Aug., 1930.

Hitherto the Common Green Capsid had been recorded as mainly confining its depredations to the foliage and shoots of its various host-plants. This record of damage to developing fruitlets of red currants is of some importance and is therefore fully described. The formation of discoloured areas on attacked fruitlets is recorded both in the field and experimentally.

AUSTIN (M. D.). **Early Control of Capsid.** *Fruit-Grower.* No. 1790, Vol. lxix, p. 554, Apr., 1930.

The early control of *L. pabulinus* is emphasised in view of the fact that this capsid migrates early in the spring to various herbaceous plants.

This migration is recorded and would seem normally to be at its highest during the latter half of May and into June.

A list of certain herbaceous plants in which summer eggs were found is given.

The use of a Nicotine and Soft Soap spray or Nicotine dusts is advocated, and the necessity of dealing effectively with capsids knocked off the bushes is indicated.

It is pointed out that, although one application of a spray, or dust, may give an apparently good control, a second application is of value.

The destruction of weed host-plants to prevent the return of the second generation is also discussed.

AUSTIN (M. D.). **Early Control of Capsids.** *Gard. Chron.*, No. 2264, Vol. lxxxvii, p. 394, May, 1930.

The early control of both the Apple Capsid and the Common Green Capsid is emphasised. With the former the use of Nicotine and Soft Soap or Nicotine dusts and the value of grease-banding are discussed, with the latter the value of effective control of the first generation is emphasised.

AUSTIN (M. D.). **Capsid Bugs Injurious to Fruit: With Special Reference to their Spring Control.** *J. Kent F.U.* Vol. xxvii, No. 5, pp. 194–200, 5 figs., May, 1930.

This paper deals with the Life-History, Description, Damage and Control of the Apple Capsid and the Common Green Capsid. Information is given under the several heads which should serve in some measure to indicate to growers when these capsids are present.

Emphasis is stressed in connection with the spring control and this aspect of the paper is more fully discussed; the early initiation of control measures is shown to be necessary especially in connection with *pabulinus*.

The advantages of grease-banding in connection with the control of *rugicollis* is discussed and the use of soil-treatment for both capsids is briefly reviewed.

AUSTIN (M. D.). **Field Experiments on the Control of the Apple Capsid** (*Plesiocoris rugicollis* Fall.) **and the Common Green Capsid** (*Lygus pabulinus* Linn.) **during 1929.** *J. S. E. Agric. Coll.*, No. 27, pp. 147–179, 3 figs., July, 1930.

Results of a comprehensive series of trials are discussed in which Tar Distillate washes, Nicotine dusts, a Nicotine spray and the use of grease-bands were used in connection with the control of *rugicollis*. Certain of these materials were found to be of practical value but better results are indicated by a combination of treatments. Grease-banding of fruit-trees is shown to be of great value, and, where impracticable, the experiments indicate that soil-treatment should be resorted to. It is suggested that the use of Tar Distillates in the winter should be followed up in the spring with the use of suitable contact insecticides.

Experiments upon the control of *pabulinus* on currants are recorded; it is demonstrated that it is unlikely that much good will be obtained from Tar Distillates in their present day form. The value of Nicotine sprays and dusts was found to be high and was further enhanced where soil-treatment was also carried out. It was shown that the earlier stages of this capsid are more susceptible to Nicotine dusts than are the later stages; early application of such material is therefore essential.

The possibilities of weed-destruction are discussed in connection with the control of *pabulinus*.

It is also suggested that with machinery at present available the dusting of bushes is more efficiently carried out than the dusting of trees; hence the greater success against *pabulinus* on bushes than against *rugicollis* on fruit-trees.

UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE.

THOMPSON (H. W.). **The Control of Root Flies in South Wales.** *Welsh J. Agric.*, Vol. vi, pp. 295–301.

This paper summarises results of tests made during the past two years on the Control of Cabbage Root Fly, Carrot Fly, and Onion Fly. Naphthalene is shown to be a successful deterrent against these pests and its use is being taken up largely by growers in the area.

NORTH OF SCOTLAND COLLEGE OF AGRICULTURE.

MORISON (G. D.). **On a Collection of Thysanoptera from South Australia.** *Bull. Entom. Res.*, 21, pp. 9–14, 1 fig., March, 1930.

Two new species of Thysanoptera are described and seven others are recorded from specimens found on various plants at the Waite Agricultural Institute, South Australia. The species recorded as *Frankliniella insularis* (Franklin) has been convicted as the vector of an important virus disease, by Messrs. Samuel, Bald and Pittman: Investigations on "Spotted Wilt" of Tomatoes. Commonwealth of Australia, Council of Scientific and Industrial Research, Bull. 44, 1930.

(J) MYCOLOGY AND VIRUS DISEASES.

LONG ASHTON FRUIT RESEARCH STATION.

BARKER (B. T. P.). **The Nature of the Fungicidal Action of Sulphur.** *Paper read before the Intern. Botan. Conf.*, Aug. 20th, 1930.

This paper contains a summary of investigations on this problem which have been in progress at Long Ashton for several years. It reviews the results already published in a series of progress reports issued from that Station and states the further conclusions reached prior to the date of the Congress.

MARSH (R. W.) and MAYNARD (J. G.). **Black Currant Leaf Spot Disease and its Control.** *J. Min. Agric.*, xxxvii, pp. 255–259, 1930.

Following a description of the disease and the effects on the host, an account is given of the result of pruning and manuring on the severity of attack. It is shown that the seriousness of the disease may be somewhat mitigated by heavy manuring and that the degree of attack varies inversely with the amount of pruning the previous season. To obtain a real control by pruning, however, the treatment would need to be so drastic as to be uneconomic.

The only practicable means of control is by spraying with Bordeaux mixture immediately after picking (*see* Long Ashton Ann. Rept., 1928, pp. 109–111). It was found that bushes thus sprayed in 1928 gave in 1929 a crop 26 per cent. heavier than that from corresponding unsprayed bushes.

A Bordeaux spray applied at any time during August will give some measure of control of the disease, but best results are obtained by spraying as soon as possible after picking. The application of a copper-lime dust has not given satisfactory control.

MARSH (R. W.) and MAYNARD (J. G.). **Supplementary Note on the Control of Black Currant Leaf Spot.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton*, 1929, pp. 166–167.

The information contained in this article is included in the paper in the Ministry's Journal—*see* preceding abstract.

MAYNARD (J. G.) and MARSH (R. W.). **Spraying Trials against Apple Scab. II. Season, 1929.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton*, 1929, pp. 155–165.

The trials of 1929 were continued on the same lines as those of the previous year. Taking into consideration, however, the diminution of the sources of infection as a result of the 1928 spraying, only one pre-blossom spray was applied in 1929. This spraying was carried out at the "green flower" stage and certain of the plots were not afterwards sprayed, while others received one application at petal fall.

The plots twice sprayed yielded 20 tons of fruit of which 99·63 per cent. was entirely free from scab. From the plots once sprayed, approximately one ton was harvested, of which 90 per cent. was free from scab.

Damage due to post-blossom spraying with Bordeaux mixture was noted on James Grieve, Cox and Lane.

Complete costs of spraying were recorded as before, and amounted to approximately 4d. per tree (for the two sprayings). This shows a considerable reduction on the previous year's figures, due, it is believed, to increased efficiency in operating the spraying outfit.

Ogilvie (L.). **Fungus disease of Fruits: *Phytophthora* rot outbreak.** *Fruit Grower*, Vol. lxvii, No. 1771, Nov. 21st, 1929, p. 874.

A prevalent rot of apples and pears due to a *Phytophthora* rot is recorded. This has since been identified as *P. Syringae*.

Ogilvie (L.). **Observations on the disease of market garden crops in the Vale of Evesham.** *Ann. Rep. Agric. and Hort. Res. Sta., Long Ashton*, 1929.

This paper is mainly concerned with asparagus "sickness," which has been shown to be not of fungus origin but probably due to potash deficiency, and with dry root rot of dwarf beans, a disease not previously recorded from this country and due to *Fusarium martii* var. *Phaseoli*.

PLANT BREEDING INSTITUTE, CAMBRIDGE UNIVERSITY.

Salaman (R. N.). **Virus Disease of the Potato: Streak.** *Nature*, Aug. 16th, 1930.

Whilst streak may be an expression of more than one virus or of a mixture of viruses, it is possible to distinguish at least two types:—

(*a*) A streak latent in most examples of the variety Di Vernon, which produces in healthy Arran Victory but a very slight mottling, but which kills healthy President plants.

(*b*) A streak latent in Up-to-Date and which may also be found latent in Kerr's Pink and Majestic, which, when introduced into healthy Arran Victory and President, induces a streak in both, which is usually more severe in the Arran Victory.

Salaman (R. N.). **Crinkle "A," an Infectious Disease of the Potato.** *Proc. Roy. Soc., B*, cvi, 50–83, 1930.

The Potato disease crinkle as defined by Murphy and others, and here called crinkle "A," is described as found on the variety President. The relations of Crinkle "A" to paracrinkle are reserved for a further communication.

The transference of the disease crinkle "A" by grafting to a number of different varieties is described; in most, the clinical appearance is that of a crinkle, in some it is acute streak, and in one, Abundance, a mosaic only.

Varietal reaction to infection by grafting with crinkle "A" is not a simple phenomenon; there is evidence that the virus itself is modified, as well as the clinical expression of symptoms on *passage* from one variety, e.g., President, to another, such as Abundance.

The result of infecting various varieties of healthy Potato with crinkle "A" by means of needle inoculation is described. It was found that in those cases where grafting had produced a crinkle, needling gave a mosaic; where grafting caused streak, needling gave crinkle; except in the case of Epicure where streak reappeared, and, finally, where grafting had produced a mosaic, needling did the same, but of a less severe character.

The possible cause of the distinction between needle inoculation and grafting is discussed, and the suggestion made that it rests primarily on the minuteness of the original effective dose attained by needle inoculation.

Reason is shown for the suggestion that the virus of crinkle "A" is a mixture of viruses, and that one element at least is responsible for the crinkle-mosaic type, and another for the streak type of symptom.

Streak itself, however, is clearly not the clinical expression of but one specific virus. Thus President can convey to Great Scot a lethal streak which produces no streak symptoms on itself; on the other hand, President can be killed in a few days by grafting with certain relatively healthy-looking Up-to-date or Duke of York plants.

The modified disease produced by inoculation in its further passage to the Potato produces only the modified disease. There is no increase of virulence.

Infection by means of imbibition of virus-injected juice has been effected, and resulted in a modification of clinical symptoms similar to that induced by needle inoculation.

The different reaction of *Datura Stramonium* plants to crinkle "A," as induced by grafting and needle inoculation respectively, is described. A typical crinkle "A" inoculation reaction is defined.

The reaction of Datura to interveinal-mosaic and simple mosaic is compared with that of crinkle "A." The reaction to paracrinkle is distinct and will be considered in a further communication.

Passage of the virus of crinkle "A" through Datura modifies its virulence, so that when transferred to a healthy Potato it produces mosaic instead of crinkle, except in the case of Epicure and Arran Crest, where a lethal streak develops.

Notwithstanding the reduction of virulence induced in the Potato by passage through Datura, reinoculation to Datura always produces the same reaction as does the original crinkle, whether it be derived directly or indirectly from President or any other varieties here considered.

A series of "double grafts" between Potato and Datura showed that the modification of symptoms induced by Datura is dependent on the interaction of the virus and the metabolic product of the actively growing Datura leaf, and that passage of the virus through a solid section of Datura stem has no such effect.

The symptoms of crinkle "A" in the varieties Arran Banner, Arran Comrade, Champion and Irish Chieftain, are described, and the reaction of the crinkle "A" as found in them on other varieties and on Datura and Tobacco discussed. The crinkle of Irish Chieftain in particular is examined in considerable detail.

Tobacco plants infected by inoculation, as well as by grafting with crinkle "A" of President, react, but the reaction is very variable in degree. Passage to further Tobaccos was carried out to the third generation. No change in virulence was observed as regards the symptoms in the Tobacco itself.

SALAMAN (R. N.) and LE PELLEY (R. H.). **Para-Crinkle: a Potato Disease of the Virus Group.** *Proc. Roy. Soc., B,* cvi, 140–175, 1930.

The presence of virus diseases in Potato plants of the King Edward variety which appear to be in perfect health, is demonstrated.

One of the latent diseases in King Edward is due to a pathogen which produces in the variety Arran Victory a violent crinkle. This disease, the subject-matter of this paper, has been named Para-crinkle.

A discussion of the virus-disease problem in Potatoes follows, in which such points as the possibility of acquiring stocks of the varieties to be examined, and for research purposes the absolute necessity of maintaining them virus-free are stressed.

No support is found for the existence of viruses in really healthy Potatoes.

The variable reaction of different varieties to the same pathogen is described and the practical importance of the absence of reaction to infection is shown.

The problem of the effect of environment on the tuber-seed of the Potato is touched on, and the opinion put forward that this effect is in reality due to the reaction of the environment on a latent or partially suppressed virus disease, and that completely healthy virus-free potatoes may prove physiologically stable within very wide fluctuations of environmental conditions.

The Para-crinkle latent in the two varieties King Edward and President is studied and the occasional differences between their behaviour in the glasshouse and in the field pointed out.

Arran Victory plants are as readily and as severely diseased by infecting from a "carrier" plant as from a visibly diseased plant of its own variety.

The symptoms of Para-crinkle in Arran Victory are described, both in the seasonal infection and in the tuber-born plant, and compared with those of crinkle "A."

The reaction of several other varieties to Para-crinkle is described. They fall into four classes: those which react like Arran Victory, with a crinkle; those which react with a mosaic; those which carry the virus but do not react visibly to it; and those which neither react to nor carry the virus. In all these experiments infection was attempted by means of grafts.

Eleven varieties were inoculated by needle with the juice of Para-crinkle infected plants with no result, whether the infective source was derived from a plant infected recently, or from King Edward where it was from infected tuber-born plants. In the case where Arran Victory was the source and itself several seasons old, an infection was effected.

Inoculation of Para-crinkle by needle to Datura is without effect, nor is there any evidence that it exists in a latent condition in the Datura. The virus, however, succeeds in entering under certain conditions. Thus, when the virus is derived from a tuber-born diseased Arran Victory plant a reaction does occur; again, when the virus has been passed by grafting through Datura and then through Potatoes, and again by needle to Datura, a reaction was obtained. The reactions thus obtained are distinct from those following needle inoculations with crinkle "A" as well as from those obtained by grafting Para-crinkle-infected scions.

Datura can be infected with Para-crinkle by grafting scions of infected and visibly diseased plants, and equally by grafting scions of "carriers." The symptoms induced are characteristic and distinct.

Double grafts made by grafting Datura, with and without leaves attached, to Arran Victory and a Para-crinkle scion to the Datura, demonstrate that passage through the tissue of a solid Datura stem, 2 inches long, has no effect on the virus, but that the presence of the leaves and the mixture of their metabolic products in the stem tissue with the virus passing through it destroys the virus.

Neither inoculation of juice nor grafting of Para-crinkle scions has any effect on Tobacco plants of the two varieties tried.

SMITH (K. M.). **Studies on Potato Virus Diseases. VII. Some experiments with the virus of a potato crinkle with notes on interveinal mosaic.** *Ann. Appl. Biol.*, xvii, No. 2, 1930.

Experiments are described dealing with the transmission by different methods of two potato viruses, crinkle and interveinal mosaic. Some evidence is brought forward to show that the symptom expression of potato crinkle may vary according to the method of transmission, i.e., by grafting, by needle inoculation or by the aphis *Myzus persicae*.

It was found that progressive inoculation of the virus of potato crinkle through the tobacco plant increased its virulence and infective power. Needle inoculation of tobacco with the crinkle virus produced a severe necrotic disease, while aphis inoculation of tobacco with the same virus produced a different symptom expression of mottling and dark green lines. Both, when returned to healthy potato, produced a severe leaf-drop streak.

The virus of interveinal mosaic produced a ringspot disease when inoculated into tobacco and this increased in virulence with progressive inoculation. When this virus was returned to healthy potato, a severe form of streak resulted which obscured the symptoms of interveinal mosaic.

SMITH (K. M.). **Insects in Relation to Potato Virus Diseases.** *J. Min. Agric.*, xxxvii, No. 3. 1930.

An account is given of potato virus diseases and their relationship to the various insects which affect the potato plant. Special attention is paid to

plant "carriers" of viruses and the part played by certain Solanaceous weeds as potential reservoirs of infection. *Solanum nigrum*, the black nightshade, is shown to be such a carrier of potato viruses and to be found frequently infected in the field. The aphis *Myzus persicae* transmits the infection to this weed from potatoes growing nearby. As *S. nigrum* can act as a biennial, such infected weeds are a source of infection for any potato crop planted in their vicinity in the following year.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

HARRIS (R. V.). **The Causes of "Running-out" and Non-Cropping of the Raspberry.** *Kent Cherry and Soft Fruit Show Catalogue*, July, 1930.

This article, written for raspberry growers, sets out the distinguishing characteristics, and the relative commercial importance of the diseases to which the raspberry is most susceptible in this country. The diseases mentioned are, Cane Spot, Cane Blight, Spur Blight, Botrytis Rot, Blue Stripe Wilt and Mosaic.

Control measures, where such are commercially practicable, are summarized.

MOORE (M. H.). **Apple Scab at East Malling.** *E. Malling Res. Sta. Ann. Rep.*, 1929. (April, 1930), 72–75.

The practical importance of the following points in their application to successful control of Apple Scab is reviewed:—

1. The time of application of sprays. Special emphasis is laid on the value of the "pink-bud" application.
2. The seasonal factor. The effect of different climatic conditions on the degree of Scab infection in 1927, 1928 and 1929, respectively, is indicated. The possible importance of heavy dews in increasing infection in the drought year of 1929 is suggested.
3. The influence of rootstock. The variety of rootstock is stated to have some influence on the degree to which the scion becomes infected by Scab.
4. The influence of manuring. Comparison between the amount of Scab on the fruit from manured Bramley Seedling trees and from similar unmanured trees showed that balanced manuring reduced the amount of Scab in the 1929 season.

MOORE (M. H.). **Apple Scab, Its Incidence and Control at East Malling.** *Ann. Appl. Biol.*, 1930, **17**, 419–424.

This paper presents in detail the results obtained in three years' investigation of the problem at East Malling. The effect on the amount of Scab infection of spraying, of manuring, and of rootstock is dealt with, and the methods used for obtaining results are described. Bordeaux Mixture is shown to be the best "Scabicide" to use, but it is unsafe on Cox's Orange Pippin, for which variety lime-sulphur is therefore recommended. Three applications, one at the "pink-bud" stage, and two after blossoming, gave very satisfactory results.

MOORE (M. H.). **The Incidence and Control of Apple Scab and Apple Mildew at East Malling.** *J. Pomol. and Hort. Sci.*, 1930, **8**, 229–247.

This contribution (Part I) deals solely with Apple Scab.

A full description is given of certain spraying experiments on the control of scab, together with the methods used for obtaining comparable results.

The results obtained are tabulated and discussed.

Bordeaux Mixture applied three times gave the best control, but lime-sulphur is preferred on Cox's Orange Pippin as being safer on this variety. The importance of the "pink-bud" application is emphasized.

The scab "pustule" on the young shoots of Cox's O.P. is described.

A preliminary trial of sulphur dusts against scab is described. The results are not very conclusive owing to the slight amount of infection.

It is shown that both the rootstock and manurial treatment have a marked influence on the degree of infection.

ROACH (W. A.). **Sulphur as a Soil Fungicide against the Potato Wart Disease Organism.** *J. Agric. Sci.*, 1930, **20**, 74–96.

Thiosulphuric acid has been shown to exist in a free state.

It is relatively stable in dilute solution; an M/200 solution is only half decomposed at the end of one day and an M/400 solution at the end of ten days only.

This degree of stability is sufficient to account for the fungicidal action of acidified thiosulphate solutions in terms of the liberated thiosulphuric acid.

It can be calculated that it is only necessary to assume 6 per cent. of the minimum quantity of sulphur found effective against Wart Disease in the field to be in the form of thiosulphuric acid over a period of ten days in order to account for its toxicity.

WORMALD (H.). **Bacterial "Blight" of Walnuts in Britain.** *Ann. Appl. Biol.*, 1930, **17**, 59–70.

An organism has been isolated from lesions on leaves, shoots, and fruit of young walnut trees at the East Malling Research Station, Kent.

This organism was proved to be pathogenic by positive results obtained from inoculations on walnut leaves and shoots.

It corresponds closely to descriptions of *Pseudomonas Juglandis*, and is therefore referred to that species.

WORMALD (H.). **Bacterial Blight of Walnuts.** *Gard. Chron.*, 1930, **88**, 216–218.

The symptoms of the disease are briefly described. Nurserymen and owners of walnut trees are asked to obtain a diagnosis of any suspicious-looking lesions so that the distribution of the disease may be ascertained and steps taken to prevent its dissemination.

Measures (based on facts known about the disease and its cause) are suggested for controlling the disease on young trees.

ROTHAMSTED EXPERIMENTAL STATION.

BRIERLEY (W. B.). *Botrytis cinerea* **and the Species Problem.** *5th Internat. Bot. Congr., Abstracts of Communications*, p. 234, Cambridge, 1930.

A summary of a paper to the Section of Mycology and Plant Pathology in which the present position of strain analysis and strain variation is outlined and the relationship of investigations on *Botrytis* to the Species concept is stated.

CALDWELL (J.). **The Physiology of Virus Diseases in Plants. I. The Movement of Mosaic in the Tomato Plant.** *Ann. Appl. Biol.*, vol. xvii, 3, 1930, pp. 429–443.

A method is described whereby it is shown that the virus agent does not travel across dead tissue even in the water stream. It will, however, travel along a band of living cells if the killing of the tissue has not been complete.

Evidence is adduced to show that the agent apparently travels normally in the plant along the protoplasmic connections from cell to cell of the ground tissue and that it does not travel exclusively in the vascular tissue.

GLYNNE (M. D.). **A Note on Some Experiments dealing with Sulphur treatment of a Soil and its Effect on Wheat Yield.** *Proc. Roy. Soc. Victoria,* 42(1) 30–35, 1929.

Sulphur and sulphur derivatives were applied to Australian soil reported to be too badly infested with disease-causing fungi to support more than a very poor crop of wheat. Remarkable increases in crop up to 821 per cent. increase over controls were obtained.

Disease appeared no more common in controls than in untreated plots suggesting a soil deficiency supplied by the treatment. This might be a deficiency of sulphur, of some element or compound set free in the soil or of something supplied by microorganisms influenced by the treatment. A stimulation of nitrogen fixing organisms is suggested. Soil acidity has also received consideration.

HAMILTON (M. A.). **Notes on the culturing of insects for Virus work.** *Ann. Appl. Biol.*, vol. xvii, No. 3, 1930.

1. Use of Cellophane for Breeding Cages.

Cellophane is recommended as a material to replace muslin or glass for the caging and isolation of small insects. Metal frameworks are described as a basis for the material, and some of its properties, *i.e.*, permeability to moisture and gases, and ultra violet light, general transparency and shrinkage are discussed.

2. Artificial feeding of *Myzus persicae.*

A method is described by which *M. persicae* may be fed on artificial media. It consists of a pair of glass capsules the upper one having a floor of fine gut skin through which the insects, caged in a lower capsule, will absorb dyes and culture fluids.

JARRETT (P. H.). **Streak: A Virus Disease of Tomatoes.** *Ann. Appl. Biol.*, vol. xvii, 3, 1930, pp. 248–259.

Streak disease of tomatoes, derived from commercial glasshouses, and experimental streak produced by combined inoculation of the viruses of potato mosaic and tobacco mosaic are compared.

Glasshouse streak and tobacco mosaic show an equal resistance to alcohol, heat and ageing in vitro, and have, in addition, an identical host range. Treatment for 1 hour with 90 per cent. alcohol and for 10 minutes at 85° C. did not destroy the infectivity of either of these viruses.

Glasshouse streak is shown not to contain the virus of potato mosaic, but is of itself able to produce necrosis in tomatoes without the participation of potato mosaic.

It is concluded that tobacco mosaic and the mosaic of glasshouse streak are probably identical, and that much of the streak occurring in glasshouses is due to a single virus, and not a mixed infection of this with potato mosaic.

JARRETT (P. H.). **The Role of *Thrips tabaci* Lindeman in the transmission of Virus Diseases of Tomato.** *Ann. Appl. Biol.*, xvii, 3, 1930, pp. 444–451.

A description is given of experiments designed to show the role of *Thrips tabaci* Lindeman in the transmission of virus diseases of tomatoes.

The diseases tested were tobacco mosaic and glasshouse streak singly, and the viruses of each of these two combined with a potato mosaic virus to give a disease termed experimental streak.

The source of the materials used and the methods employed are described in detail;

In no case was transmission of any of the viruses recorded, although the insects had fed freely on all the plants. It is concluded that *Thrips tabaci* does not transmit virus diseases of tomatoes under all conditions. The importance of this insect as a vector of these diseases in commercial glasshouses in England is, therefore, doubtful.

NORMAN (A. G.). **The Biological Decomposition of Plant Materials. Part III. Physiological studies in some cellulose-decomposing fungi.** *Ann. Appl. Biol.*, 1930, 17, 3, 575–613.

Certain fungi were isolated, which, though actively attacking cellulose in straws, make only a meagre growth on cellulose agar plates. All had their optimum temperature above that usual for fungal growth; three, indeed, could develop at 50° C. The thermogenic power of the organisms individually was tested on sterile straw. A considerable and rapid rise in temperature was observed in most cases, and some rise in all. The highest temperature attained was 49° C. due to *Trichoderma sp.* The period of maximum heat production was shown to correspond closely with that of rapid loss of hemicelluloses. Cellulose decomposition does not appear to result in the production of much heat. Certain combinations of organisms were tested and the theoretical differences between competitive and co-operative association defined.

SHEFFIELD (F. M. L.) and SMITH (J. HENDERSON). **Intracellular bodies in plant virus diseases.** *Nature*, Feb. 8, 1930.

When *Solanum nodiflorum* is infected with yellow or aucuba mosaic of tomato, it is possible to follow the development within the living cell of the protein X-bodies. A few days after inoculation, innumerable small particles appear and move passively in the cytoplasmic stream. They enlarge, aggregate and fuse until ultimately a single large mass, the X-body, is accompanied by a crystalline spike but by no other abnormal inclusions. In all old leaves the X-body tends to crystallise out.

SMITH (J. HENDERSON). **Intracellular Inclusions in Mosaic of** *Solanum nodiflorum*. *Ann. Appl. Biol.*, xvii, pp. 2, 3–22, 1930.

The inclusions formed after inoculation with aucuba mosaic are described in detail and illustrated. They correspond to the vacuolate amoeboid bodies produced in other hosts by other viruses, are protein in nature, and tend to crystallise. Their mode of formation by aggregation of small particles has been followed throughout in individual living cells, and accounts satisfactorily for the appearances which have led other observers to believe that they are parasitic organisms, a view for which no support has been obtained in this work.

SMITH (J. HENDERSON). **Virus Diseases in Plant. I. Translocation within the Plant. II. The Amoeboid Intracellular Inclusions.** *Biol. Rev.*, v, pp. 159–169, 1930.

A review of the present state of knowledge on these two aspects of virus disease.

SMITH (J. HENDERSON). **Virus Diseases of Plants.** *A System of Bacteriology*, vol. vii, pp. 42–53. Published by the Med. Res. Council, Lond., 1930.

A general summary of information on this subject:

SMITH (J. HENDERSON). **The Differentiation and Classification of Plant Viruses.** *5th Internat. Bot. Congr. Abstracts of Communications*, pp. 224–225, Cambridge, 1930.

The opening paper at the discussion on this subject by the Joint Sections of Bacteriology and Mycology and Plant Pathology. The variation of symptoms in virus disease produced by environmental change is so great as to render identification by appearance often impossible in the field. Further the disease expression varies with the method of inoculation, and the viruses themselves are unstable and liable to change. Differentiation by tests which do not depend on symptoms is still tentative, but can be developed further, and offers a promising field of work, but it is as yet premature to attempt a system of general classification intended to be permanent.

STOUGHTON (R. H.). **The Morphology and Cytology of** *Bacterium malvacearum* E.F.S. *Proc. Roy. Soc.*, cv, pp. 469–484, 1929.

Bacterium malvacearum, the causal organism of the "Black-Arm" disease of cotton, has been found to possess certain internal structures and a variety of different morphological forms. An internal structure is described, which passes through a diversion-cycle and is suggestive of a nucleus. Small granules are described, which are found in the wall of the cell and freed by a process of extrusion. These bodies resemble the "gonidia" of other writers. The occurrence and mode of formation of spherical coccus-like bodies is described. Various atypical forms are found to occur in old cultures.

STOUGHTON (R. H.). **I. The influence of environmental conditions on the development of the angular leaf-spot disease of cotton. II. The influence of soil temperature on primary and secondary infection of seedlings.** *Ann. Appl. Biol.*, xvii, 493–503, 1930.

Using the apparatus described in the previous paper it is found that the amount of primary infection of seedlings raised from infected seed decreases at soil temperatures above 30° C., but infection is not inhibited at 40° C. Soil temperature has little or no effect on secondary infection resulting from spray inoculation of the leaves.

STOUGHTON (R. H.). **Thionin and Orange G. for the differential staining of bacteria and fungi in plant tissues.** *Ann. Appl. Biol.*, xvii, pp. 162–164, 1930.

An account of a new and simple method of differentially staining fungal and bacterial parasites in plants.

STOUGHTON (R. H.). **The relation of environmental conditions to angular leaf-spot disease of cotton** (*Bacterium malvacearum* E.F.S.). *Ann. Appl. Biol.*, xvi, 188–189, 1930.

An account of experiments carried out in a small experimental chamber, showing that temperature and humidity are inter-related factors in their effect on disease. An abstract of a paper read to the Association of Economic Biologists.

STOUGHTON (R. H.). **Angular leaf-spot disease of cotton.** *Nature*, cxxv, No. 3149, pp. 350–351, 1930.

Evidence obtained at Rothamsted indicates that soil temperature has not so marked an effect of primary infection of seedlings as has been claimed by other workers. No evidence was obtained for the hypothesis of extensive internal infection of cotton seed, although occasional infection of this type

was found. No indication of extensive spread of the parasite through the plant was found. The organism has been found to show the phenomenon of "dissociation."

STOUGHTON (R. H.). **The morphology and cytology of** *Bacterium malvacearum* E.F.S. *5th Internat. Bot. Congr. Abstracts of Communications*, pp. 16–17, Cambridge, 1930.

An account of the nuclear-like division process in *B. malvacearum*, and of the formation and subsequent germination of the spherical reproductive bodies.

STOUGHTON (R. H.). **The infection of cotton plants by** *Bacterium malvacearum* **in control chambers.** *5th Internat. Bot. Congr. Abstracts of Communications*, pp. 210–211, Cambridge, 1930.

An account of the construction of control apparatus and of the influence of soil and air temperature on the angular leaf-spot disease of cotton. Primary infection of seedlings is greatest at soil temperatures below 30° C., while secondary infection is favoured by air temperatures above this value.

JOHN INNES HORTICULTURAL INSTITUTION.

CAYLEY (D. M.). **Some Observations on Mycetozoa of the Genus** *Didymium*. *Trans. Brit. Mycol. Soc.*, **14**, 227–248.

Observations on the behaviour and development of three species of *Didymium* on artificial media are discussed. The process of fusion of motile swarm spores of *D. difforme* in both mono-spore and pluri-spore cultures is described. Plasmodiocarps have been obtained from three successive generations of mono-spore cultures in this species, showing that the spores of *D. difforme* are bisexual, and that sex differentiation must occur at some division after the germination of the spores.

HUGHES (A. W. McK.). **Aphis as a Possible Vector of "Breaking" in Tulips.** *Ann. Appl. Biol.* **17** (1): 36–42. Feb., 1930.

The virus causing "breaking" in Tulips is shown to be transmitted by the aphide *Myzus persicae* and to a lesser extent by *Macrosiphum gei*.

EXPERIMENTAL AND RESEARCH STATION, CHESHUNT.

BEWLEY (W. F.) and BOLAS (B. D.). **Aucuba or Yellow Mosaic of the Tomato Plant: Reaction of Infected Juice.** *Nature*, Jan. 25th, 1930.

A photo-sensitive reaction is observed between infected juice and an aqueous solution of colloidal chlorophyll prepared from fresh tomato plants. The reaction manifests itself by a destruction of the characteristic green colour and the development of a brown. The reaction has not been observed to occur to the same extent with a previously boiled sample of infected sap, and does not appear to be directly correlated with the oxidase or peroxidase content of the sap.

BOLAS (B. D.) and BEWLEY (W. F.). **Aucuba or Yellow Mosaic of the Tomato: A Note on Metabolism.** *Nature*, Sept. 27th, 1930.

Marked local changes in the starch distribution are observed in inoculated leaves, these are often in the following order:—inhibition of starch removal in the dark, formation of a zone in which removal is accelerated, complete removal and inhibition of starch formation in the light. Starch removal from the uninoculated leaves of an artificially infected plant in the dark appears to be accelerated in the early stages of infection while local absence

of starch precedes the appearance of symptoms. Marked accumulation of starch is found in parts of the leaves and complete absence in other parts after symptoms have developed. The acidity of an aqueous extract of infected leaves sampled at dawn is greater than that of healthy leaves. Tentative suggestions are made as to metabolism.

SMALL (T.). **The Relation of Atmospheric Temperature and Humidity to Tomato Leaf Mould** (*Cladosporium fulvum*). *Ann. Appl. Biol.*, xvii, 1, pp. 71–80 (1930).

Experimental evidence is adduced to show that tomato leaf mould is closely correlated with atmospheric temperature and humidity. The optimum temperature for the various stages of the disease is about 22° C. Under humid conditions severe infection occurs at 10° C. to 15° C., but the subsequent development is slow. At 22° C. infection is severe at 80 per cent. humidity but rare at 70 per cent., while at 18° C. all stages of the disease are considerably retarded at 80 per cent. humidity. Seasonal variations in the severity of leaf mould are shown to be related to temperature. Experiments indicate that the humid night conditions obtaining in large glasshouses are largely responsible for severe attacks of the disease. The wetting of the foliage caused by overhead watering was not found to favour the disease, but excessive soil watering produced soft, susceptible plants. Suggestions are made for controlling the disease by cultural methods.

PLANT PATHOLOGICAL LABORATORY, MINISTRY OF AGRICULTURE AND FISHERIES.

PETHYBRIDGE (G. H.). **Fungus and Allied Diseases of Crops, 1925, 1926 and 1927.** *Min. Agric. Misc. Publ.* 70, 75 pp., 4 figs., 1929.

This report on fungous, bacterial, and allied diseases of economic crops observed in England and Wales from 1925 to 1927, inclusive, is based chiefly on the monthly summaries and annual reports furnished to the Ministry of Agriculture and Fisheries by the mycological advisers in the various districts. It is compiled on the same lines as the preceding report (R.A.M., v, p. 468) and contains, among others, the following new records. *Ascochyta brassicae* (stated to have been recorded previously in Northern Ireland) was found on cabbage in Devonshire in 1925; leaf spots of broad bean (*Vicia faba*) were caused in Devonshire by *A. fabae* and in Kent and Oxford by *Cercospora fabae* during 1927, but the resultant damage was not severe. *Bacterium delphinii* was present on delphinium seedlings in Buckinghamshire in 1926, and killed off adult plants near Reading the year following. On various occasions appreciable losses resulted from a storage rot of imported gladiolus corms caused by Penicillium gladioli (ibid., vii, p. 448). A leaf spot of cucumber was reported from Cheshunt in 1926 as due to *Phyllosticta cucurbitacearum*.

The general situation during the period under review is briefly discussed with special reference to the prevailing weather, and notes are also given on investigations which are being conducted in various parts of England and Wales into the control of plant diseases. Throughout the report numerous references are made to recent literature dealing with the diseases concerned.

PETHYBRIDGE (G. H.) and MOORE (W. C.). **"Dry Pickling" or "Dusting" Seed Wheat to prevent Bunt: Results of co-operative trials by Advisory Mycologists in England and Wales, 1927-28.** *J. Min. Agric.*, **37**, 1930, pp. 429–439.

PETHYBRIDGE (G. H.) and SMITH (A.). **A Watery Wound Rot of the Potato Tuber.** *J. Min. Agric.*, **37**, 1930, pp. 335–340.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

TOMKINS (R. G.). **Studies of the Growth of Moulds. I.** *Proc. Roy. Soc.* 1929, B, **105**, 375.

A study of moulds germinating on a substrate or soil in equilibrium with the atmosphere, included the effect of humidity on the rate of germination, the relation between temperature and the range of humidities where germination can occur and the significance of the surface, with and without nutrients, in determining the rate of germination and range of humidity and temperature within which growth is possible.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

BENNETT (F. T.). *Gibberella Saubinetii* (Mont.) **Sacc. on British Cereals.** *Ann. Appl. Biol.*, xvii, Feb., 1930.

During 1928–29 *Gibberella Saubinetii* (Mont.) Sacc. (= *Fusarium graminearum* Schwabe) was discovered on bases and grains of wheat and barley grown in several parts of England. The methods by which it was isolated and grown in pure culture, and its diagnostic characters, are described. Whilst the ascigerous condition is unknown in nature in this country, it was produced freely *in vitrio* under suitable conditions, and the complete life cycle of this "strain" was then carried through from single-conidium and single-ascospore pure cultures.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

WHITEHEAD (T.). **Dry-Rot of Swedes. Second Progress Report.** *Welsh J. Agric.*, Vol. vi, 1930.

The writer records many further failures to obtain evidence of seed infection, but arrives at the conclusion that the possibility of seed infection to a minute extent must be conceded. Evidence is presented to show, however, that other factors, such as soil and weather conditions, play the most important part in determining whether there is sufficient spread from the initial seed or soil infections as to make the disease of serious consequence.

WHITEHEAD (T). and CURRIE (J. F.). **Potato Leaf-Roll. Development of Secondary Symptoms in the Year of Infection.** *J. Min. Agric.*, May, 1930.

This is the full presentation of evidence in support of the view that (*a*) secondary symptoms of leaf-roll invariably develop in plants infected in a sufficiently early stage of growth; (*b*) the stage of growth, beyond which secondary symptoms will not develop the same year, varies with the variety; (*c*) older plants show either rolling of the top leaves only or no symptoms at all; (*d*) an incubation period of about one month is necessary before external symptoms develop.

The view is expressed that the presence of secondarily infected plants in a commercial crop will afford a reliable index of the degree of infection of the seed stock only if it is known that the plants had passed the critical period of growth before aphis infestation occurred.

WHITEHEAD (T.). **Transmission of Potato Leaf-Roll.** *Nature*, June 28th, 1930.

This is a short preliminary statement of the success obtained in transferring leaf-roll by means of an aphis (*Myzus circumflexus*), hitherto considered to be unable to transmit the disease.

WHITEHEAD (T.). **A Study of the Degeneration of Certain Potato Stocks.** *Ann. Appl. Biol.*, Vol. xii, No. 3, 1930.

Working with stocks of two varieties maintained for periods up to seven years, it was found that the relation between virus infection and loss in yield is a linear correlation of an extremely high order; the correlation co-efficient being 0·83 ± 0·46 with Kerr's Pink, and 0·97 ± 0·008 with Great Scot. One effect of prolonged home-saving of seed was to increase the number of tubers failing to produce a plant—this being a source of loss hitherto unsuspected, and probably, though not certainly, due to increased virus infection. There was no evidence that the rate of degeneration was influenced by the size of "set" planted. In the variety Kerr's Pink there was no significant difference in virus infection in "ware," "seed," or "chats." This was almost equally true of the variety Great Scot so far as leaf-roll was concerned, but the chats produced a higher percentage of mosaic and crinkle plants than did the ware. The effect of climatic, seasonal and varietal factors on the rate of degeneration of a partially infected crop was also studied. Climatic and topographical factors were shown to play an important part, by comparing the vigour of the same stocks of two varieties grown for the same period of years at the College Farm and at Madryn Castle Farm School. Seasonal factors, by affecting the breeding of aphides and the vigour of potato stocks were also of importance. A heavily infected crop in an exceptionally good growing season may show a smaller loss as compared with healthy stocks than it did in a previous year in which there was less disease but a poorer growing season. Varietal susceptibility was discussed, as was also the value to be attached to such field trials.

CAMBRIDGE UNIVERSITY.

WESTON (W. A. R. DILLON). **Observations during 1927-28 on the Incidence of "rusts" on various selected wheat varieties, with special reference to the intensity of yellow rust,** *Puccinia glumarum*, **Eriks. and Henn.** *Ann. Appl. Biol.*, xvi, No. 4, Nov., 1929.

1. Observations on the incidence of yellow, brown and black rust on selected wheat varieties are recorded.
2. The intensity of yellow rust on these wheat varieties is given.
3. It is shown that bunt increases the susceptibility of varieties ot yellow rust.
4. It is suggested that in testing wheat varieties for resistance to *P. glumarum* the seed should be previously bunted, and that if no yellow rust then appears that the variety should be regarded as truly resistant.
5. It is suggested that a generalisation cannot be made that the 28 chromosome group is more resistant to pathogens than the 42 chromosome group, and also that there is no firm foundation for believing that the species and varieties of wheat that are resistant to rust are resistant to bunt and *vice versa*.

PETHERBRIDGE (F. R.). **The Incidence and Control of Apple Scab.** *Proc. Assoc. Econ. Biol.*, II. *Ann. Appl. Biol.*, xvii, No. 2, pp. 416–419.

The results of three years' spraying of apples in the Wisbech area show the cumulative effects of spraying a variety like Worcester with a suitable fungicide.

Worcester trees over 20 years old, in the Eastern Counties, are often regarded as being unprofitable. These experiments show that scab is capable of bringing about this state of affairs, but that it can be remedied and a big profit obtained if the trees are sprayed with either lime-sulphur or Bordeaux mixture.

They also show that tar-oil spraying alone is of little value on a variety like Worcester when scab is prevalent. A comparison is made of the value of lime-sulphur and Bordeaux mixture. A table is given, for the use of growers in the Eastern Counties, showing the strengths of lime-sulphur suitable for use on most of the commercial varieties of apples.

A table is given showing the variability of commercial samples of lime-sulphur.

MANCHESTER UNIVERSITY.

SMITH (E. H.). **An Autumn-sowing Onion variety resistant to Frost and White Rot** (*Sclerotium cepivorum*, Berk.). *Gard. Chron.*, Vol. lxxxvi, No. 2240, Nov. 30th, 1929, 3 figs.

The Autumn-sowing variety of Onion called White Welsh, so largely grown on the Continent of Europe, was the only one of five varieties which survived 28 degrees of ground frost in Lancashire and Cheshire in February, 1929. It also exhibited a considerable degree of resistance to White Rot (*Sclerotium cepivorum*, Berk.). The variety was apparently impure, as a white strain and a pink or red strain of plants was distinguishable. The white strain seemed to be the most resistant to White Rot. It was characterised by an unusually strong and deeply penetrating root system, recalling that of a Leek. It is suggested that if the white strains were separated out, seeded and a pure line maintained, this might prove a valuable one in English gardens and be supplementary to the popular, but highly susceptible variety, White Lisbon.

SMITH (E. H.). **A Method of Soil Sterilization.** *J. Min. Agric.*, Vol. xxxvi, pp. 629–632. Oct., 1929, 3 figs.

A method of sterilizing soil by means of dry heat in a rectangular brick-built container, was devised by a Cheshire nurseryman, named Warburton, in 1909. His idea was founded upon the system employed for baking bricks at a local brickworks. The heat from the fire-box at one end passed along three intercommunicating flues under the trough and was regulated by means of a damper, so that all the soil in the trough received a full share. So-called improvements on the idea have failed to give the same satisfaction. The apparatus is cheap and easy to erect, It serves for the destruction of weed seeds and some soil pests, but is not as satisfactory as steam under pressure for the destruction of Eelworms and disease producing Bacteria sometimes present in plant debris and soil. Detailed measurements and diagrams are given.

SMITH (E. H.). **Control of Clubroot and Root Maggot** (*Chortophila brassicae*, Bouche.). *Gard. Chron.*, lxxxvii, No. 2263, pp. 371–372, 5 figs, May 10th, 1930.

Very satisfactory results in the combined control of Clubroot (*Plasmodiophora brassicae*), Wor.) and Root Maggot of Cabbage, Cauliflower and other species of Brassicas, were given in Lancashire during 1929, by the following methods. Before sowing the seed, corrosive sublimate solution (1 in 2000) was applied to the soil in the drills at the rate of 1 pint per 5 ft. of drill. A second application at the rate of 1 quart per 5 ft. of drill was applied between the drills when the plants were 2 inches high, and repeated the day before transplanting the seedlings. At planting out each dibbled hole was filled up twice with the solution, and allowed to drain away before inserting the plant. 97·6 per cent. of Cauliflower plants so treated were cut for market, of which 94·3 per cent. were of first-class grade; while only 44·2 per cent. of the untreated plants were marketable. Directions and precautions are given regarding the preparation and handling of the solution.

MIDLAND AGRICULTURAL COLLEGE.

STIRRUP (H. H.). **Investigations on Celery Diseases and their Control.** *Min. Agric. Bull.* In press.

(*a*) The chief seedling disease is a root rot, probably caused by *Pythium artotrogus*. The disease arises from the use of contaminated soil in the frames and can be prevented by the disinfection of such soil with 2 per cent. formalin.

(*b*) *Phoma Root Rot* (*Phoma apiicola*) is a disease of seedlings and adult plants affecting the region just below the collar. This disease is seed borne and can partially be controlled by seed treatment.

(*c*) The hitherto recommended treatment of celery seed infected with *Septoria Apii* is shown to be only partially successful in controlling the "Blight" disease.

(*d*) Details are given of experiments with various sprays and dusts for controlling "Blight."

(*e*) Success has been achieved in the production of commercial quantities of celery seed free from infection with *Septoria Apii*. The plants obtained from this healthy seed did not show a single *Septoria* leaf spot.

(*f*) Promising results were obtained in experiments to control the insect pest *Psila Rosae* by dusting the celery rows with naphthalene.

STIRRUP (H. H.). **Recent Progress in Economic Mycology.** *Agric. Prog.*, 1930.

This paper gives examples of the recent progress in economic mycology during the last few years. The examples include plant protection, virus diseases, seed-borne and soil-borne diseases, spraying and the epidemiology of common plant diseases.

STIRRUP (H. H.). **Clover Rot.** *Derbyshire Farmer*, Vol. 10, No. 6, June, 1930.

A short account of the disease of clover known as Clover Rot together with remedial measures. This disease had been causing damage to clover crops in Derbyshire.

STIRRUP (H. H.). **The application of scientific knowledge to the fungous diseases of certain vegetables.** *Encycl. Scientific Agric.* In press.

A short paper showing how the application of scientific knowledge can be used to control and prevent certain diseases of beans, celery, and Brassicae. A method of disinfecting the soil in frames and seed boxes with formalin to prevent soil-borne diseases of seedlings is described.

OXFORD UNIVERSITY.

WOODWARD (R. C.). **A Home-made Mixing Machine for Dressing Wheat with Copper Carbonate.** *Sch. of Rural Econ. Pamph.*, Nov., 1929. *Farmer and Stockbreeder.* In press.

A rectangular box, 6 ft. × 6 ft. × 1 ft. 6 in. mounted after the fashion of a churn is described. The box is dust-proof and when the wheat to be treated is churned after the addition of the requisite amount of powder, it becomes thoroughly coated. Baffle plates fill up the corners at one end and are also arranged in a middle position across the sides to ensure thorough mixing. A convenient filling aperture and spout are described. The capacity of the box is two bushels; powder is added at the rate of 2 ozs. per bushel.

READING UNIVERSITY.

Buddin (W.) and Wakefield (Elsie M.). **Further notes on the connection between** *Rhizoctonia crocorum* **and** *Helicobasidium purpuremu. Trans. Brit. Mycol. Soc.*, xiv, 1–2, pp. 97–99, 1929.

Further support for the view previously expressed by the authors of the genetic relationship between *Rhizoctonia crocorum* and *Helicobasidium purpureum* (R.A.M., vi, p. 756) was supplied by Ware's record of the occurrence of both fungi in association on black medick (*Medicago luputina*) [*see* above, p. 510], and Watson's similar record on the roots of Sitka spruce (*Picea sitchensis*) [*ibid.*, viii, p. 280]. Nine of the ten Sitka spruce seedlings examined by them had their collar encircled by the fructification of *H. purpureum*, and the connection of this with the mycelium of *R. crocorum* on the roots below was unmistakable. Cultures raised from the infection cushions of *R. crocorum* on the roots of black medick material supplied by Ware, and from *H. purpureum* from the same host, agreed in their general behaviour with isolations previously obtained from other hosts. When tested in 1927 for their pathogenicity to carrots and mixed clovers in pots, the isolations of *R. crocorum* gave roughly 50 per cent. infection on the former but much less on the latter, while cultures derived from spores of *H. purpureum* did not give rise to any infection. A strain of *R. crocorum* isolated from cotton in Trinidad which was tested at the same time, failed to infect both carrots and mixed clovers, but is interesting in that, after some weeks of sub-culturing, it reduced pustules of *Tuberculina*-like conidia, exactly resembling those already described in the authors' earlier paper.

These results support the opinion that strains of *R. crocorum* from different hosts vary considerably in virulence. It was particularly noted that strains which produce conidia appear to be less strongly parasitic than those that do not, since successful infections have, up to the present, only been obtained with spore isolations from cultures that did not produce any conidia. In their final conclusion the authors state that the evidence recorded in this paper leaves no doubt that *H. purpureum* is the perfect stage of *R. crocorum*.

Buddin (W.) and Wakefield (Elsie M.). **The fungus causing leaf rot of the Carnation.** *Trans. Brit. Mycol. Soc.*, xiv, 3–4, pp. 215–221, 3 figs., 1929.

In giving some details of their study of the carnation leaf rot fungus (*Pseudodiscosia dianthi*) [R.A.M., vi., p. 554; vii, p. 426,] the authors point out the great similitude that exists, particularly in the shape of the conidia, between this organism and the conidial, parasitic stage of *Heteropatella antirrhini* [*ibid.*, vi, p. 230]. In the material examined by them the conidia were borne on cylindrical, frequently branched conidiophores, 3 to 4μ in diameter, this being the only important difference from the description of the fungus given by Hstermann and Laubert. Further, a careful search on the lower, old and very rotten leaves of diseased carnation plants, and on the lower portions of still living leaves, revealed the presence on them of pycnidial fructification of the *Heteropatella* type. The pycnidia were from 0·25 to 0·5 mm. in diameter, and the spores, when ripe, were extruded in dirty white globules. Single spore cultures raised from the *Pseudodiscosia* conidia and from the *Heteropatella* pycnidia invariably resembled one another in appearance and in behaviour, and both were proved to be pathogenic to carnations. In no case were pycnidia produced in pure cultures. For these reasons the fungus is referred to the genus *Heteropatella* and named *H. dianthi*, a Latin diagnosis of which is appended.

The *Cercosporella* stage of *H. antirrhini* is now referred by the authors to the genus *Pseudodiscosia* and is renamed *P. antirrhini*.

SEALE HAYNE AGRICULTURAL COLLEGE.

Beaumont (A.) and Hodson (W. E. H.). **Sixth Annual Report of the Department of Plant Pathology for the year ending September 30th, 1930.** *Seale Hayne Agric. Coll. Pamph. No.* 31, 28 pp. Newton Abbot, 1930.

A general account is given of diseases during the year and special articles on work carried out on Potato Blight, Fungal Diseases of Narcissus Bulbs, Narcissus Fire, Gladiolus Diseases. A full abstract will be found in the Review of Applied Mycology for October, 1930, p. 623.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

Bagenal (N. B.), Goodwin (W.), Salmon (E. S.) and Ware (W. M.).— **The Control of Apple Scab. I. Bramley's Seedling and Newton Wonder.** *J. S.E. Agric. Coll.*, xxvii, 186–194, July, 1930.

Plots of Bramley's Seedling and Newton Wonder were sprayed either twice or thrice with home-made Bordeaux mixture or with Lime-Sulphur alone or mixed with Arsenate of Lead. A good control of scab was secured. Except on one plot, the addition of Lead Arsenate to Lime-Sulphur did not increase the fungicidal value. On Newton Wonder, Lime-Sulphur, particularly when Lead Arsenate was added, caused "scorching" injury, while no injury was caused on Bramley's Seedling.

Goodwin (W.), Martin (H.) and Salmon (E. S.). **The Fungicidal Properties of Certain Spray Fluids, VI.** *J. Agric. Sci.*, xx, Part I, pp. 18–31, Jan., 1930.

Ground sulphur and flowers of sulphur when wetted with a solution of soft soap were found to have a very marked fungicidal action on the hop powdery mildew (*Sphaerotheca humuli*). With alkaline spreaders other than soft soap the fungicidal action was also favoured, whereas with spreaders of an acid nature, viz., gelatine and saponin, it was inhibited. The influence of the spreaders was also found to be the same in the case of a commercial colloidal sulphur.

Goodwin (W.), Martin (H.) and Salmon (E. S.). **Polysulphide sulphur in Relation to the Fungicidal Efficiency of certain Spray Materials.** *Ann. Appl. Biol*, xvii, No. 1, pp. 127–136, Feb., 1930.

The fungicidal properties of solutions containing sulphur in polysulphide form, viz., lime sulphur, liver of sulphur and solutions containing sodium, potassium, ammonium, calcium and barium, polysulphides were found to be determined by the content of polysulphide sulphur of the spray fluid. The biological tests were upon the Hop Powdery Mildew (*Spraerotheca humuli*).

Goodwin (W.), Martin (H.) and Salmon (E. S.). **The Fungicidal Properties of certain Spray-Fluids, VII.** *J. Agric. Sci.*, xx, Part III, pp. 489–497. July, 1930.

Further trials of solutions containing sulphur in polysulphide form, viz., sodium, potassium, calcium and barium polysulphide, confirmed the view that the polysulphide sulphur content is a measure of the fungicidal power of spray-fluids of this class.

Goodwin (W.) and Salmon (E. S.). **Spraying Hops in Russia.** *Brewers' Journ.* **66**, No. 777, p. 152.

Goodwin (W.). **Fungous Diseases of Plants in Agriculture, Horticulture and Forestry.** A translation from the German of Prof. Jakob Eriksson's "Die Pilzkrankheiten der Kulturgewächse." London, Baillière, Tindall, and Cox.

Goodwin (W.) Salmon (E. S.) and Ware (W. M.). **The Control of Apple Scab. II. Allington Pippin and Newton Wonder.** *J. S.E. Agric. Coll.*, xxvii, 195–201, July, 1930.

Plots sprayed three times with home-made Bordeaux mixture gave 13 per cent. scab-affected apples with Allington Pippin and 26 per cent. with Newton Wonder, while the percentages in the unsprayed plots were 77 and 79 respectively. Two post-blossom applications of Lime-Sulphur following a pre-blossom application of Bordeaux mixture gave no better "finish" to Allington Pippin than did three applications of Bordeaux mixture.

Martin (H.). **The Hydrolysis of Sulphur in Relation to its Fungicidal Activity.** *J. Agric. Sci.*, Part I, pp. 32–44, January, 1930.

The fungicidal action of sulphur upon the *Erysiphaceae* is considered to be due primarily to hydrolysis, the presence of alkali accelerating this hydrolysis. An explanation is thus afforded of the promotion of fungicidal action with soft soap and alkaline spreaders and its inhibition by gelatine or saponin solutions. Attention is drawn to analogies between the action of sulphur upon the mildew and upon copper.

Martin (H.). **The Defoliation of Gooseberries by Sulphur-containing Sprays.** *J. S.E. Agric. Coll.*, No. 27, pp. 182–185, July, 1930.

Lime sulphur, dry-mix sulphur lime and colloidal sulphur caused defoliation of the variety Leveller. Addition of aluminium sulphate to the lime sulphur did not diminish the amount of leaf fall. It is suggested that elementary sulphur is responsible for the defoliation.

Martin (H.). **Chemistry and certain Problems of Applied Mycology.** *J. Soc. Chem. Ind.*, xlix, 11–14T, 1930.

A paper read at a meeting of the London Section of the Society of Chemical Industry on December 2nd, 1929.

Martin (H.) and Salmon (E. S.). **Vegetable Oils as Fungicides.** *Nature*, cxxvi, **58**, July, 1930.

Certain vegetable oils (e.g., olive, sesame and cotton seed) possess marked fungicidal powers when used against the conidial stage of the Hop Powdery Mildew (*Sphaerotheca Humuli*).

Salmon (E. S.). **Apple Scab, its incidence and control.** *Ann. Appl. Biol.*, xvii, 408–416, May, 1930.

A critical résumé is given of the factors concerned in the incidence of apple scab in this country, and of the best methods of controlling the disease.

Salmon (E. S.) and Ware (W. M.). **The Downy Mildew of the Hop in 1929.** *J. Inst. Brew.*, xxxvi, 63–67, 1930.

An account is given of the incidence of Downy Mildew in commercial hop gardens in 1929. The labour required for the removal of diseased growths ("Spikes") was estimated by regular visits to a hop farm. Notes are given on the perennation of the mycelium of the fungus in the hop root-stock; on the effects of spraying hops when in "burr" with Bordeaux mixture, and on the occurrence of the fungus in British Columbia.

SALMON (E. S.) and WARE (W. M.). **Root-rots of Asparagus.** *Gard. Chron.*, lxxxvii, 2258, April, 5th, 1930.

Records the second occurrence in this country of *Zopfia rhizophila* on Asparagus roots. The occurrence of *Rhizoctonia crocorum* attacking roots is also described.

SALMON (E. S.) and WARE (W. M.). **The Chlorotic Disease of the Hop.** *Ann. Appl. Biol.*, xvii, 241-247, May, 1930.

A description is given of a new virus disease of the hop characterised by weakness of growth and by the presence of yellowish (chlorotic) markings on the leaves, accompanied by distortion of the lamina. Experiments are recorded which show that the disease is transmissible by grafting.

WEST OF SCOTLAND AGRICULTURAL COLLEGE.

O'BRIEN (D. G.) and PRENTICE (E. G.). **Leaf Stripe or Yellow Leaf of Oats.** *Scott. J. Agric.*, Vol. xiii, No. 3.

Helminthosporium Avenae (Br. et. Cav.) is shown to be a common parasite on Oats grown in the South-West of Scotland. It attacks the plants at two stages in their life history. (1) The primary phase of the disease is noted on the first, and subsequently on the second and third seedling leaf, causing withering and death of affected leaves. (2) The second phase is noted on the uppermost leaves at or about the flowering stage and brings about infection of the developing grain and the premature ripening of the whole plant.

The primary phase of the disease is traceable to sclerotia and resting mycelia present on the seed, while the secondary phase is due to infection from spores abundantly found on the withered leaves of primary affected plants.

Results are detailed of treating seed with the dry powder disinfectant-Ceresan—carried out on a field scale on a number of farms. In every case the braird on the treated section was much healthier, more uniform, and more vigorous than that on the untreated section.

The average increase of establishment at eight centres due to seed treatment was 91 per cent. and the percentage of plants visibly affected with primary leaf stripe was 28 on the untreated compared with 4 on the treated.

(K) HELMINTHOLOGY.

INSTITUTE OF AGRICULTURAL PARASITOLOGY.

GOODEY (T.). **The Stem Eelworm,** *Tylenchus dipsaci* (Kühn, 1858): **Observations on its attacks on Potatoes and Mangolds with a Host-list of plants parasitized by it.** *J. Helm.*, Vol. 7, No. 4, Dec., 1929.

An account is given of a field experiment carried out in 1928 at Winches Farm to test the susceptibility of several varieties of potatoes to attack by *T. dipsaci*. The following were all found to be susceptible: *Earlies*—Epicure, Sharpe's Express, Duke of York; *Second Earlies*—Great Scot, British Queen; *Main Crop*—King Edward, Majestic, Arran Chief, Kerr's Pink, Up-to-date.

Dealing with the pathology of the parasite, it is shown that it brings about primarily a dissolution of the middle-lamella substance between the cells of the cortex.

The symptoms of attack on Mangolds are described and a host-list of 126 plants, wild and cultivated, is given.

GOODEY (T.). **On some details of comparative anatomy in** *Aphelenchus Tylenchus* **and** *Heterodera*, *J. Helm.*, Vol. 7, No. 4, Dec., 1929.

The opening of the dorsal oesophageal gland is shown to be in the anterior part of the muscular bulb of the oesophagus in *Aphelenchus*, but close to the base of the stylet in *Tylenchus* and *Heterodera*.

The three genera, *Aphelenchus*, *Tylenchus* and *Heterodera* are compared and the chief points of resemblance and difference are listed under the following heads: (1) General body-form; (2) Male Characters, (3) Female Characters; (4) Oesophageal glands: (5) Stylet. In a final section the view is put forward that the glandular parts of the amphids or lateral organs are homologous with the cephalic glands of many animal-parasitic nematodes.

GOODEY (T.). **On the Presence of Fats in the intestinal-wall of Nematodes.** *J. Helm.*, Vol. 8, No. 2, June, 1930.

Shows that fat globules in the intestinal-wall of nematodes have been recognised by earlier workers and deals with the recognition and demonstration of such fats by various stains in numerous plant-parasitic and free-living nematodes. By reason of their abundance and frequency, such fats are regarded as a principal product of digestive metabolism. They occur as droplets of non-drying oils and it is concluded that they are fats of saturated fatty acids or of such an unsaturated fatty acid as oleic acid.

GOODEY (T.). **A new species of the nematode genus** *Cylindrogaster*. *J. Helm.*, Vol. 8, No. 2, June, 1930.

Worms obtained from debris underneath the bark of a fallen elm tree were found to belong to the genus *Cylindrogaster*, established by the writer in 1927. They exhibited the characteristically shaped oesophagus of the genus but differed from the first described species, *C. longistoma*, in the female having a single gonad and in the male possessing a caudal expansion in the form of a bursa supported by 10 pairs of rays. The new species is named *C. ulmi*.

GOODEY (T.). **On a Remarkable new Nematode,** *Tylenchinema oscineliae* **gen. et sp. n., parasitic in the Frit-Fly,** *Oscinella frit* **L., attacking oats.** *Philos. Trans. Roy. Soc. Lond.*, B., Vol. 218, pp. 315–343, plates 22–26, June, 1930.

In swollen stems of seedling oats attacked by frit-fly, ensheathed larvae and young adults of a small Tylenchoid nematode were found in the debris surrounding the fly larvae. The spermatized females were next found within the body-cavity of the fly larvae, later in the pupae and finally in adult flies of both sexes. The parasitic female grows into a large sausage-shaped viviparous worm by the time the fly emerges from the pupa, and brings about the sterilisation of the host by preventing the development of its reproductive organs. The larvae of the worm grow within the body-cavity of the host, make their way into its gut and pass to the exterior via the anus. Flies of the stem and panicle generation were found infected; the former to about 14 per cent., and the latter to about 5 per cent. of the population. The new parasite has a wide distribution in England and Wales. A new genus, *Tylenchinema*, is erected for its reception.

GOODEY (T.). **On the Nematode Parasite of the Frit-Fly,** *Oscinella frit* **L.** *J. Helm.*, Vol. 8, No. 3, Sept., 1930.

A short account of the foregoing paper, somewhat differently set out and without illustrations.

LEWIS (E. A.). **An Account of a Survey of the parasitic helminths of some Domestic Animals in Mid-West Wales.** *J. Helm.*, Vol. 8, No. 1, Feb., 1930.

The helminthological survey of the county of Cardigan made by Morgan (1924–25) was continued for a further period of four years by the author, and was based largely on an examination of animals slaughtered for market in Aberystwyth. Six hundred and sixty-eight sheep showed an infection rate of 95·2 per cent. for parasitic worms. A series of tables give (*a*) incidence of different helminth species occurring in sheep in each month of the year; (*b*) variations of helminthic infection in lambs and sheep; (*c*) the actual number of parasites collected from individual sheep and lambs throughout the period 1925–28, and (*d*) seasonal incidence of tapeworms in sheep.

The internal parasites found in poultry and gamebirds in the same area are also listed.

MORGAN (D. O.). **The Entozoal Parasites of the Goat in Britain.** *Brit. Goat Soc. Yr. Bk.*, 1930, pp. 32–34.

Twenty species of Helminths found in goats in Britain are referred to, and notes are included on their occurrence in the animals examined at the Institute of Agricultural Parasitology. *Skrjabinema ovis* and *Trichostrongylis capricola* are recorded for the first time as occurring in this country.

MORGAN (D. O.). **The Helminth Parasites of the Goat in Britain, including an Account of** *Skrjabinema ovis* **(Skrjabin, 1915), Werestchagin, 1926.** *J. Helm.* 1930, Vol. 8, pp. 69–76.

In addition to the list of Helminths which have been found in the goat in this country, a description is given of *Skrjabinema ovis*. The occurrence in England of this worm, which had only previously been found in Turkestan, is also discussed.

OLDHAM (J. N.). **On** *Hymenolepis sinensis* **n. sp.; a New Cestode from the Grey Sand-Hamster** (*Cricetulus griseus*). *J. Helm.*, Vol. 7, No. 4. Dec., 1929.

A post-mortem examination of a Grey Sand-Hamster, originating from China, revealed the presence of several cestodes which, upon examination, proved to be a new species of *Hymenolepis*.

A detailed morphological study of the tapeworm, a description of which is included in the paper, was made. Studying the relevant literature revealed the existence of two other species of *Hymenolepis* parasitic in Hamsters. The morphological characters, host records and geographical distribution of all three species are discussed and these summarised in tabular form. Notes on technique and a specific diagnosis of the new species are included.

TRIFFITT (M. J.). **On the Occurrence and Significance of** *Heterodera schachtii* **infesting certain Weeds.** *J. Helm.*, 1929, Vol. 7, pp, 215–222.

Experimental efforts to transmit the British potato-strain of *H. schachtii* to other species of the Solanaceae were unsuccessful, but a natural infection of couch grass was found in Lancashire, while a strain attacking mangolds was also found to parasitise several grass species. An indigenous infection of a *Heterodera* species on sea marram grass is reported, and the morphology of the nematode is described. The possible significance of this parasite as a reservoir of infection is discussed in connection with the findings mentioned above.

TRIFFITT, (M. J.). **On the Bionomics of** *Heterodera schachtii* **on Potatoes, with Special Reference to the Influence of Mustard on the Escape of the Larvae from the Cysts.** *J. Helm.*, 1930, Vol. 8, pp. 19–48.

The influence of potato root excretion in causing the larvae to hatch, and of mustard root excretion in neutralising the stimulant action of the former, are discussed, together with their stability under various physical conditions. The necessity of a supply of free oxygen to enable hatching to take place is correlated with the effects of light and heavy soils on the intensity of nematode attack, and the existence of a dormancy period in the winter months during which hatching will not take place is also recorded.

MINISTRY OF AGRICULTURE AND FISHERIES, VETERINARY LABORATORY.

TAYLOR (E. L.). *Liponyssus Sylviarium* **injuring Poultry in this Country.** *Parasitol.*, Vol. 22, No. 3, July, 1930.

There appears to be only one previous record of this parasite doing damage in the British Isles. An outbreak which occurred in Dorsetshire is briefly described, and successful treatment by painting the perches with nicotine sulphate is recorded.

TAYLOR (E. L.). **Some Factors concerning the Occurrence of Disease due to Strongyloid Worms in Grazing Animals—Verminous Gastritis, Hoose, and Equine Strongylidosis.** *Vet. Rec.*, July 12, 1930.

This paper analyses the way in which over-stocking, close-grazing, bad nutrition, and prolonged grazing lead to the production of worm diseases; and discusses the idea that there is a danger point of sheep concentration on grazing land above which the numbers of worms will increase and finally produce disease, and below which the number of worms will tend to decrease.

TAYLOR (E. L.). **Gapes** (*Syngamiasis*)**—The Relation of Wild Birds to the Disease among Chicks.** *Fourth World's Poult. Cong.*, July, 1930.

The author discusses the factors concerned in the development of the disease. There is evidence that different kinds of birds carry different strains of syngamus. The inability of a single male or female to exist in the trachea implies a minimum infective dose of the larvae. The earthworm probably

acts as a collector and storer of infective larvae. It is concluded that the importance of wild birds in the propagation of syngamiasis has been overestimated.

TAYLOR (E. L.). **The Use of Drugs in the Treatment of Diseases caused by Nematode and Trematode Worms.** 11*th Internat. Veter. Cong.*, Lond., 1930.

This paper gives a résumé of the knowledge acquired in the subject during the time following the previous report in 1914.

TAYLOR (E. L.) and BAYLIS (H. A.). **Observations and Experiments on a Dermatitis-Producing Cercaria and on Another Cercaria from *Limnaea Stagnalis* in Great Britain.** *Trans. Roy. Soc. Trop. Med. and Hyg.*, Vol. 24, No. 2, Aug., 1930, pp. 219–244.

This paper describes the behaviour and morphology of a cercaria thought to be identical with *C. ocellata*, and of a cercaria which spends a metacercarial stage in the lenses of the eyes of fishes. *C. ocellata* is shown to be capable of penetrating skin, and causing a dermatitis. It is probable that this cercaria belongs to the family *Schistosomatidæ*. The other cercaria, which attacked and often killed experimental fish of various species, did not penetrate skin. This second species is thought to belong to the genus *Diplostomum*.

TAYLOR (E. L.). **Stomach Worms in Sheep.** *J. Min. Agric.* Vol. xxxvi, No. 1.

It is generally supposed that sheep on arable land are not subject to verminous gastritis, but, as pointed out in this paper, severe outbreaks of the disease are by no means uncommon where the Wiltshire rotation is practised. Reason for its appearance in these circumstances are given, and it is shown that the disease can with certainty be controlled by a slight change in the rotation of crops. A short description of the kinds of worms involved and of their life histories is also given, along with general recommendations for control.

DEPARTMENT OF ANIMAL PATHOLOGY, CAMBRIDGE.

WOOD (W. A.). **On a New Species of *Labiostrongylus*.** *Ann. and Mag. Nat. Hist.*, Ser. 10, Vol. iv., p. 550, Dec., 1929.

This is a description of a new species of nematode of the genus *Labiostrongylus* (Yorke) from *Macropus Woodwardi*. Western Australia.

WOOD (W. A.). **Experiments on the Treatment of Parasitic Gastritis in Sheep and Lambs.** *J. Agric. Sci.*, April 30th, 1930.

The experiments were undertaken with the object of testing the anthelmintic properties of various drugs on sheep naturally infested with stomach worms—the effect being estimated by egg counts.

While confirming the observations of other workers the results failed to establish a reliable agent against worms other than *H. contortus*.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

BLISSETT (A. H.) and LITTLE (W. L.). **The Need for further Knowledge concerning Parasitic Diseases of Pigs.** *Ann. Appl. Biol.*, **17**, 1, Feb., 1930.

Since 1926 obscure ailments, sometimes resulting in death, have been experienced during pig feeding experiments carried out at the National Institute for Research in Dairying. After investigations carried out in

conjunction with the Department of Animal Pathology at Cambridge it was concluded that the deaths were due to internal parasites. The first outbreak was attributed to an infection by *Hyostrongylus rubidus*, the second to *Oesophogastomum dentatum*. The method of examination is described. It was found that pigs could become infected at a very early age, and that accommodation of breeding sows in woods and outlying buildings provided more favourable conditions for parasitic infection than the animal house.

DEPARTMENT OF ZOOLOGY, EDINBURGH UNIVERSITY.

CAMERON (T. W. M.). **A new record of the occurrence of a Tapeworm of the Genus *Bertiella* in Man.** *J. Helm.*, vii, 231–234, 1929.

The genus *Bertiella*, which is related to the tapeworms of herbivores, is found in apes and monkeys and very occasionally in man. This is a new human record from St. Kitts, British West Indies. It is significant that man seems to have acquired most of his parasites from animals with which he was most closely associated under conditions of domestication, rather than through a process of evolution from prehuman stock.

CAMERON (T. W. M.). **The species of *Subulura* molin in primates.** *J. Helm.*, viii, 49–58, 1930.

Although monkeys are very closely related to human beings, their parasitic fauna differs considerably. This article describes a new species and redescribes several old species of the nematode genus *Subulura* in these animals. Most of the other species of this genus are found in birds; none have been recorded from man.

CAMERON (T. W. M.). **Helminth Parasites of Stock in the British West Indies.** *J. Helm.*, viii, 77–84, 1930.

This is a survey of the parasites of equines, pigs, and ruminants in Trinidad, Barbados, the Windwards and the Leeward Islands, made by the writer on an extended visit to these islands. Most of the stock has been imported from Europe, India, or North America; and no new species of helminths were encountered. Infections were commonest on clay soils, whereas on the loose volcanic or the porous chalk soils the moisture content was too low. In general there is a high incidence with a low degree of infection and as a rule, helminthic disease is uncommon. The article gives a list of the helminths found with notes on their occurrence and frequence.

CAMERON (T. W. M.). **Parasitology—A Retrospect.** *Vet. Rec.*, x, 688–692, 1930.

This is a historical account of the development of veterinary parasitology from ancient times to the present day. In a general conclusion, it is pointed out that as the bacterial and virus diseases of animals come more and more under control and as agricultural science makes possible a larger and still larger population on a limited area of ground, so must the parasitic diseases become more and more important. The rapid transport of non-immune animals to new localities where a different parasitic fauna is found; the permanent retention of animals in a confined space; the lack of treatment or non-recognition of carriers, are conditions which breed danger to man's flocks and herds.

ANIMAL DISEASES DIVISION, MINISTRY OF AGRICULTURE, NORTHERN IRELAND.

RICE (J. P.). **Intestinal worms of poultry.** *Eggs*, 1930, Vol. xxiii, No. 4.

A description of the life histories of roundworms and tapeworms. *Capillaria retusa* is regarded as the most dangerous nematode infecting British poultry. Nicotine sulphate and Kamala are recommended.

MANCHESTER UNIVERSITY.

MILES (H. W.). **Field Studies on** *Heterodera schachtii* Schmidt **in Relation to "Potato Sickness."** *J. Helm.*, viii, pp. 103–122, 1930.

In this paper an account is given of field studies in north-west England. The invasion of the roots in the early summer and the development of the eelworms is described, parallel observations being made on the condition of the host plants. The influence of attack by *Corticium solani* simultaneously with that by eelworm is also considered. It is shown that the number of eelworms developing on the host plant bears some relation to the cyst content of the soil. The writer concluded that the potato plant possesses a high degree of tolerance for the eelworm and a considerable power of recovery from attack by *Corticium solani*, and suggests that there are other factors which at the outset depress the scale against the plant and in the presence of eelworm and fungus disease produce "potato sickness."

Experiments on soil treatment are described. It is shown that calcium cyanamide is of considerable value in increasing the yield in the potato sick areas under observation.

WEST OF SCOTLAND AGRICULTURAL COLLEGE.

O'BRIEN (D. G.) and PRENTICE (E. G.). **An Eelworm disease of Potatoes caused by** *Heterodera Schachtii*. *W. of Scot. Agric. Coll. Research Bull. No.* 2.

Heterodera schachtii, the organism responsible for the so-called nematod or eelworm disease of potatoes, is widely distributed in Britain.

The symptoms of the disease appear both on the aerial and on the underground parts of the plants and are described in detail.

Secondary infection of plants attacked by *Heterodera schachtii* is common. The principal secondary parasite is *Rhizoctonia solani* (*Corticium vagum* B. and C.).

The yield from infected plants compared with that of healthy plants varies from year to year, but it is always low in seasons unfavourable to the growth of the potato.

The life-history of the potato eelworm is given.

The disease is spread mainly by planting tubers obtained from a crop grown in soil infested with the potato eelworm.

Control measures have been tried with some measure of success.

(L) ANIMAL HUSBANDRY
(general and not classifiable under M, N, O and P).

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

DAVIDSON (H. R.) and DUCKHAM (A. N.). **First Report on the East Anglian Pig Recording Scheme.** June, 1929. Published by the Dept. of Agric., Univ. Cambridge. Price 1s. net. Postage 2d.

DUCKHAM (A. N.). **Second Report of the East Anglian Pig Recording Scheme.** (Memorandum on principles and methods of operation). Oct., 1929. Published by the Dept. of Agric., Univ. Camb. Price 1s. net. Postage 2d.

DUCKHAM (A. N.). **Pig Recording in East Anglia.** *J. Min. Agric.*, xxxvi, No. 8, Nov., 1929.

The policy of the Scheme is to provide a pig recording and pig intelligence service in a complete but simple and practicable form. Various pig recording and testing organisations are at present operating in Sweden, Germany, Denmark, Scotland, Finland, Esthonia, New Zealand, The United States and elsewhere, as well as in East Anglia. Two chief types of pig recording are in use, the testing station and the survey or farm weighing system. The East Anglian Pig Recording Scheme employs the latter method.

The results obtained by the East Anglian Scheme between October, 1927, and March, 1929, show that wide differences exist in the pig-producing efficiency and the cost of production of the various herds; that only two-fifths of the pig carcases handled were suitable for the production of good quality bacon, and that gilts' or lighter carcasses between 140–160 lb. (dead weight) are of better Wiltshire bacon quality than hogs' or heavier carcasses. The principal carcass faults were "too thick back fat," "heavy shoulders" and "deficient length."

Final litter records in respect of 141 litters completely disposed of, or otherwise accounted for, were issued up to March 31, 1929, and the average, excluding 33 records rejected for various reasons, was as follows:—

No. of pigs born live	10·1
No. of pigs alive at 8 weeks	7·6
Average weight of pigs at 4 weeks	13·2 lb.
Average weight of pigs at 8 weeks	25·8 ,,
Total litter weight at 8 weeks	196·1 ,,
Average weight of pigs at slaughter	217·4 ,, live weight.
Average weight of pigs at slaughter	159·7 ,, dead ,,
Average weight of pigs at slaughter	132·6 ,, curing ,,
No. of pigs recorded at slaughter	6·1
Average loss from live to dead weight	22·4 per cent.
Average loss from dead to curing weight	16·9 ,, ,,
Average age in days at slaughter	258·5
Average age in days required to reach 150 lb. dead weight	250
Good quality bacon carcasses	36 per cent.

DUCKHAM (A. N.). **The Interpretation of Pig Recording Results.** *Pig Breed. Ann.*, 1929–30. Lond., 1929.

DUCKHAM (A. N.). **Aspects of Pig Recording.** *Essex F. U. Yr. Bk.* Chelmsford, 1929.

Two popular articles explaining the (now obsolete) methods of interpreting pig records used by the East Anglian Pig Recording Scheme.

DUCKHAM (A. N.). **Rationalising the Pig Industry.** *Pig Breed. Ann.*, 1930–31. London, 1930.

A popular article urging rationalisation through the use of pig recording, improved feeding and marketing methods and a pig intelligence service—all operated by a central pig producers' organisation.

HAMMOND (J.). **L'Influence des conditions naturelles sur la production animale.** XIV *Cong. Inter. D'Agric. Actes*, 3rd Vol., p. 605, Bucarest, 1929.

It is by adapting production to natural conditions that economic success is attained. The main function of the animal in Agriculture is to form a means of cashing those crops which are not saleable for human consumption direct. Since the animal lives on the plant it is to the effect of natural conditions on plant life that we should turn for an explanation of local differences in animal production. It is the climatic conditions acting on the rate at which the development of the plant proceeds that determine the suitability of the plant as a nutritive basis for milk production, fattening, or merely rearing purposes, according as it is in the protein, carbohydrate or fibrous state of development; thereby largely determining the type of animal production that can be most profitably employed. The breeds most valuable for production have arisen in areas where the natural nutrition is suitable for the purpose. In areas of scanty herbage a small animal because of its smaller maintenance requirement will have more surplus for production; so that in these districts cattle tend to give way to sheep. The profitableness of pig keeping depends on the supply of inferior qualities and by-products of crops produced for human consumption, for meat produced as a by-product in this way is able to compete more favourably in the world's markets than that which is produced as the main source of output. The chemical composition of the feeding stuffs available determines economically the nature of the production and the type of animal produced.

HAMMOND (J.). **Animal Production—The Influence of natural conditions on Animal Production.** *Trop. Agric.*, Vol. 7, No. 6, p. 147.

An English translation, with additional illustrations, of the above paper.

WOODMAN (H. E.). **Recent Pasture Research in Great Britain.** *Trop. Agric.*, vi, No. 12, 1929.

A review of research which has been carried out in Great Britain during the last decade into the problems of pasture, with special reference to the results and practical significance of the Cambridge investigations.

WOODMAN (H. E.). **The Modern Aspects of Grassland Husbandry.** *Young Farmers' J.*, Dec., 1929 and Jan., 1930.

An account of the Cambridge grassland investigations for non-technical readers.

ANIMAL BREEDING RESEARCH DEPARTMENT, EDINBURGH UNIVERSITY.

CALDER (A.). **Experiences of Pig Testing in Scotland.** *Pig Breed. Ann.*, 1930.

An account of the organisation of the Pig Testing Station recently established at the Animal Breeding Research Department, with an explanation of its purpose and how it provides data of importance for the student of pig husbandry.

CALDER (A.). **Commercial Pig Production in Scotland.** *Trans. Highl. Agric. Soc. Scot.*, 1930.

A review of the lessons which the conduct of the Scottish Bacon Pig Competitions have taught.

CALDER (A.). **Report on the Bacon Pig Competition held at the Highland and Agricultural Show, Dumfries, 1930.**

CALDER (A.). **Revision of Classification of Pigs at Fat Stock Shows.** *N.P.B.A. Gazette*, 1930.

CREW (F. A. E.). **Eggs of Abnormal Size, Shape and Consistency.** *Feathered World*, Feb. 21st, 1930.

Eggs of abnormal size, shape and consistency were examined. It was found that the bird which lays the largest normal egg also lays the largest abnormal, and this applied not only to the hen but also to ducks, geese and turkeys. The abnormal eggs examined, numbering a hundred, were readily divisible into two groups according to shape, one group being a diminutive replica of the ordinary egg and the other much more cylindrical. The former was much the more common, and in sixty-five out of the total ninety-one of this group, yolk was present either surrounded by membrane or lying free within the albumen. It appears that the size and shape of all eggs is dependent on the size and shape of a central mass which, in the normal egg, is the yolk, and in the abnormal either yolk, inspissated albumen or blood clot.

PICKARD (J. N.): **Further studies on the Wool Production of Angora Rabbits.** *H. Adams Utility Poult. J.*, Vol. xv, No. 7, 1930

PICKARD (J. N.). **The New Fur Breeds in 1929.** *Brit. Fur Rabbit Soc. Yr. Bk.*, 1930.

PICKARD (J. N.). **Rabbit Research in Great Britain.** *Nat. Rabbit Council Yr. Bk.*, 1930.

PICKARD (J. N.). **The Stud Buck.** *Universal Angora Rabbit Club Yr. Bk.*, 1930.

PICKARD (J. N.), BARRITT (J.) and KING (A. T.). **The Effects of Cystine Diet on Keratin Composition in Rabbit Wool.** *Biochem. J.*, Vol. xxiv, No. 4.

Angora buck rabbits have been fed for 3 months on a normal diet and on diets with the addition of varying amounts of cystine obtained from wool hydrolysate.

In general, a large increase in the sulphur content of the fur of individual rabbits has been found between the two successive 3-month periods, January to April, and April to July, in the controls as well as in the cystine-fed animals. The maximum increase observed was 18 per cent., and this occurred with rabbit No. 301 on normal diet throughout.

While the fleece weights are generally less for the shorter second period, the fleece weight ratios for the two periods are substantially the same with the cystine-fed animals as with the controls.

SMITH (A. D. B.). **Pedigree.** *Live Stoc. J. Ann.*, 1930.

SMITH (A. D. B.). **Supplying the World with Beef. West Africa and a possibility of the Future.** *Elder Dempster Rev.*, 1930.

SMITH (A. D. B.) **Recording the Milk.** *Ayrshire Cattle Soc. J.*, Vol. 2. No. 3, 1930.

SMITH (A. D. B.) and CALDER (A.). **First Report of the Pig Testing Station covering period June, 1928–March 31st, 1930.**

In addition to being a full report of the proceedings of this Station, the Report shows how valuable the Station is to the constructive breeder. From experience gained through its conduct much knowledge has been amassed not only relating to genetics but also to the wider aspects of pig husbandry.

(M) ANIMAL BREEDING AND PHYSIOLOGY.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

HAMMOND (J.). **Recent Advances in Agricultural Physiology.** *Sci. Prog.*, No. 94, p. 231, 1929.

A brief review of recent work on:—

Milk Production (a) Mammary development, (b) Age changes, (c) Intervals between Calvings, (d) Milk Secretion, (e) Composition. *Ruminant Digestion.*

HAMMOND (J.). **Recent Advances in Agricultural Physiology.** *Sci. Prog.*, No. 98, p. 210, 1930.

A brief review of recent work on:—(1) Growth and Under-nutrition and (2) Meat Production.

HAMMOND (J.). **The Control of Fertility in the Rabbit.** *4th World's Poultry Cong.*, London, 1930, Section F, No. 151.

A short description of the normal processes of reproduction and the results of recent work on the means by which fertility is controlled.

HAMMOND (J.). **Breeding for Milk.** *Central Council Milk Rec. Soc. Yr. Bk.* 1930.

A comparison of the methods employed in different countries. In a character which can be measured only in the female sex the male forms a weak link in the line of inheritance. The value of proven sires is pointed out and methods for producing such sires are suggested.

HAMMOND (J.). **Inbreeding.** *Cairn Terrier Assoc. Yr. Bk.*, 1930.

A short popular article explaining how it is that while inbreeding has been used to great advantage by the pioneers of British live stock improvement it has also in some cases led to degeneration, loss of vigour and fertility, and to the appearance of abnormalities.

HAMMOND (J.). **Probleme der Fleischerzeugung.** *Züchtungskunde*, Bd. 4, p. 543, 1929.

A brief account of some of the problems of meat production. Various factors which affect *quantity or live weight growth* are discussed. In general those animals which reach a given weight in the least time do so with the smallest consumption of food per pound of weight gained, so that for practical purposes it is sufficient to record the weight for age without the trouble of recording the food intake. The *quality of meat* is dependent on *the proportions of the tissues* and the conformation of the animal: as animals grow up they not only increase in size but also change in the proportions of the parts and tissues of the body. The rate and extent of these changes in proportions determines the quality of the meat and is the real basis of early maturity. Since the plane of nutrition affects the changes in the proportions of the body it is considered that selection in a suitable environment is the method by which the evolution of domestic animals for production purposes has proceeded and that man can guide evolution by the environment he creates. These principles as applied to carcase percentage, proportions of joints, distribution of the fat and edibility are discussed in detail.

HAMMOND (J.). **The Effect of Temperature on the Survival *in vitro* of Rabbit Spermatozoa obtained from the Vagina.** *Brit. J. Exp. Biol.* vii, p. 175, 1930.

The time during which *spermatozoa*, obtained from the vagina of the female rabbit after service, retain their fertilizing power when kept *in vitro* at different temperatures has been determined. At 35° C. or just below body temperature young are obtained up to 14 hours; at 10° C. up to 96 hours, and at 0° C. up to 16 hours, there being a well-marked optimum temperature for survival.

Not only does percentage of animals fertile fall with increase in the length of time the sperm is kept but also the average size of the litter decreases; in the small litters so obtained the birth weight is increased considerably and the duration of pregnancy slightly lengthened. The sex ratio is not materially affected by keeping the sperm. Sterility due to adherent tubes was frequent during the course of the experiment. These results with sperm obtained from the vagina are compared with those obtained in a parallel series (by Dr. A. Walton) direct from the epididymes of the male under paraffin.

HAMMOND (J.) and MARSHALL (F. H. A.). **Oestrus and Pseudo-pregnancy in the Ferret.** *Proc. Roy. Soc.* 'B'. **105**, 607–630, 1930.

The size of the vulva in the ferret provides an index to its sexual condition. Size is minimal in anoestrus, pregnancy, pseudo-pregnancy and lactation, while throughout oestrus it is enlarged to 50 times anoestrous size. In absence of coitus, oestrus may extend for 5 months. During this period, follicles are enlarged but do not discharge; there is no mammary growth. Ovulation occurs at any time during oestrus, but only after coitus. A sterile mating is followed by pseudo-pregnancy which lasts as long as true pregnancy. In pseudo-pregnancy and pregnancy the uterine mucosa and mammary gland changes are practically identical and this is ascribed to the action of the corpus luteum which develops to the same extent and persists for the same time in both conditions. The corpus luteum begins to atrophy at 5½ weeks, or 3–4 days before parturition, and there is no corpus luteum of lactation. The rhythm or the cycle normally depends on the periodic formation of the corpus luteum in the ferret. The vulval increase is related to the follicular phase and gives no indication of the luteal phase.

MCCANCE (R. A.) and WALTON (A.). **A Double Sex Reversal in a Hen.** *J. Hered.*, Vol. xxi., No. 3, 1930.

Description of a hen which assumed male plumage, spurs and male behaviour, and later, with exception of the spurs which were retained, reverted to the normal. No pathological lesions were found in the ovary or ductless glands.

MARSHALL (F. H. A.). **Sexual Behaviour in Birds.** *Nature*, Oct. 26th, 1929.

By analogy with the results of recent researches on endocrine relations in the mammal it is suggested that sexual posturing in birds has a physiological significance in that the anterior pituitary lobe is stimulated to produce a secretion which causes ovulation and other ovarian changes.

WALTON (A.). **The Effect of Temperature on the Survival *in vitro* of Rabbit Spermatozoa obtained from the *vas deferens*.** *Brit. J. Exp. Biol.*, vii, No. 2.

1. A technique is described for the investigation of *in vitro* problems with spermatozoa removed from the *vas deferens* of the rabbit. The method

involves the protection of the spermatozoa by means of liquid paraffin from evaporation or rapid gaseous exchange.

2. The survival of functional integrity (fertilizing capacity) has been shown to be a function of temperature and the effect of temperature has been studied over the range from 45° C.–0° C. Above body temperature the spermatozoa are rapidly destroyed. At body temperature (40° C.) maximal survival is about 13 hours. As the temperature is lowered survival becomes increasingly prolonged until a maximum of 7 days is reached at 15° C. The curve over the range from 15° C.–40° C. is only approximately exponential and it is doubtful whether an analogy can be drawn between the effect of temperature on the velocity with which the spermatozoa are destroyed and the effect of temperature on the velocity of many biological actions which follow approximately the van't Hoff and Arrhenius equations. Below the optimum temperature (10–15° C.) the velocity of destruction is accelerated by fall of temperature.

3. The sex ratio of the resulting offspring is not significantly altered by keeping the spermatozoa outside the body.

WALTON (A.). **On the Function of the Rabbit Cervix during Coitus.** *J. Obstet. Gynaec.*, xxxvii, 1930.

Coloured fluids injected into the vagina of the doe rabbit before coitus are not carried into the uterus. The cervix is so constructed anatomically as to prevent effectively the passage of fluid substances. It is concluded that during coitus the semen of the male is not carried into the uterus by contractions accompanying the female organs and hence that the spermatozoa enter the uterus by means of their own motive powers.

SMALL ANIMAL BREEDING RESEARCH INSTITUTE, CAMBRIDGE UNIVERSITY.

PEASE (M. S.). **The inheritance of some Structural Defects in Swine.** *Pig Breed. Ann.*, 1930–31.

PUNNETT (R. C.) and PEASE (M. S.). **Genetic Studies in Poultry. VII. Notes on Polydactyly.** *J. Genet.*, xxi, 341–366.

This paper is an attempt to analyse data on polydactyly collected during the last 20 years of poultry breeding work at Cambridge. It was not found possible to make any simple factorial scheme for the inheritance of polydactyly and the incidence of asymmetry in this character. It is concluded that there is a principal factor for the extra-toes; though this factor often behaves as a normal dominant, there are many cases where it seems to be carried by ordinary four-toed birds. If this is due to an inhibitor factor, then it is shown that this inhibitor factor can, nevertheless, be carried by a polydactylous bird. A simple theory is insufficient, and the gaps in the evidence are so great that an elaborate theory fails from want of experimental support.

PUNNETT (R. C.) and PEASE (M. S.). **Genetic Studies in Poultry. VIII. On a case of sex-linkage within a breed.** *J. Genet.*, Vol. 22, pp. 395–397, 1930.

An experiment was started in 1921 to discover the effect of combining the Plymouth Rock Barring (which is a sex-linked dominant character) with the Campine barring (which is an ordinary recessive). This was done by crossing the Plymouth Rock with the Campine and then mating back the F_1 birds to pure gold Campines, keeping always the progeny which showed the dominant barrings. Eventually birds were found which when mated to pure Campines, gave only their own type and pure Campines. Such

birds differ from pure Campines only in that they contain the dominant sex-linked barring factor. When mated together they gave, as would be expected, birds homozygous for the sex-linked barring factor, as well as the heterozygotes and pure Campines. The downs of the homozygous barred birds differ markedly from the heterozygous barred birds, and since barring is sex-linked, the homozygous birds are always males and the heterozygous birds always females. We have here, then, a pure breed in which the male chicks are sharply distinguished from the female by the down character.

ROTHAMSTED EXPERIMENTAL STATION.

FISHER (R. A.). **The evolution of dominance in certain polymorphic species.** *Amer. Nat.*, Vol. lxiv, pp. 385–406, 1930.

Polymorphism in wild populations must usually imply a balance of selective agencies, of which the simplest type is a selective advantage of the heterozygote over both homozygotes. Such a condition should not be confused with the maintenance of a rare mutant type against counter-selection by means of repeated mutations. While such mutations should on the theory of the selective modification of dominance tend to become recessive, heterozygotes in polymorphic species will tend to resemble in external appearance whichever homozygote it is most advantageous to resemble. The selective balance must then be maintained by some constitutional disadvantage of the homozygous dominant.

Nabours' experiments with the grouse locust *Apotettix* do, in fact, show such a deficiency of homozygous dominants as is required by this theory. The average amount of the deficiency is about 7 per cent. In six individual cases the deficiency is statistically significant, and six more show a non-significant deficiency, against two showing a non-significant excess.

The incidence of dominance and linkage in the fish *Lebistes reticulatus* strongly suggests that the colour genes found by Winge are advantageous in the male but disadvantageous in the female.

The association of the three peculiarities of polymorphism, close linkage and the universal recessive type of dominance is found in molluscs, arthropods and vertebrates. It is tentatively suggested that, at least in the grouse locusts and the snails, the primary cause of the two other phenomena may be found in the closeness of linkage within or between chromosomes. This condition presents an obstacle to normal evolutionary development by gene substitution, and so makes it possible for abnormalities such as duplications to possess occasional advantages, so setting up the stability of the gene-ratio necessary for polymorphism; if the advantage lies in the external appearance, the polymorphism will be manifest, and the variant form will tend to become dominant.

FISHER (R. A.). **Note on a tri-colour (Mosaic) mouse.** *J. Genet.*, Vol. xxiii, pp. 77–81, 1930.

The occurrence is reported of a female mouse showing both black and chocolate markings. Only one such case has occurred out of about 1,500 blacks heterozygous for chocolate, bred in the same colony. Mating with a chocolate son gave 30 chocolates, 16 blacks and no tri-colours. The case resembles that of a male guinea-pig reported by Wright and Eaton, which also shows a deficiency of heterozygous offspring. The most probable explanation of both cases is that we have a mosaic, both somatically and in the germinal tissue, originating in non-disjunction. Some apparently analogous cases in mice and rabbits point, however, to a different interpretation for these cases.

FISHER (R. A.). **The evolution of dominance; Reply to Professor Sewall Wright.** *Amer. Nat.*, lxiii, pp. 553–556, 1929.

Abstracted under "D."

ANIMAL BREEDING RESEARCH DEPARTMENT, EDINBURGH UNIVERSITY.

CALDER (A.). **Livestock Improvement. Suggested methods of improvement in Cattle Breeding.** *N. Scot. Coll. Former Students Trans.*, 1930.

CREW (F. A. E.). **Genetical Methods of Livestock Improvements.** *J. Roy. Soc. Arts.*, Vol. lxxviii, No. 4043, 1930.

CREW (F. A. E.). **Imperial Bureau of Animal Genetics.** *J. Min. Agric.*, Vol. xxxvi, No. 2, 1930.

An account of the work of this Bureau.

CREW (F. A. E.). **Puberty and Maturity.** *Proc. 2nd Inter. Cong. f. Sex Research*, 1930.

Being the Presidential Address delivered at the Second International Congress for Sex Research held in London from 3rd to 9th August, 1930.

CREW (F. A. E.). **On the Effect of Density on an Adult Mouse Population.** *Biol. Gener.*, 1930.

CREW (F. A. E.). **To the Advancement of Science and to the Service of Mankind this Building is Dedicated.** *Oliver and Boyd*, 1930.

A Brochure issued in connection with the Opening Ceremony of the Department on June 30th, 1930. The brochure surveys the history of the Department from its earliest beginning to the present day.

CREW (F. A. E.) and MIRSKAIA (L.). **Mating during Pregnancy in the Mouse.** *Nature*, Apr. 12th, 1930.

It would seem that mating during pregnancy in the rat and mouse is a very rare occurrence as out of 100 females under observation for six months only 6 presented trustworthy evidence that it had occurred without in any way affecting the course of pregnancy.

CREW (F. A. E.) and MIRSKAIA (L.). **The Lactation Interval in the Mouse.** *Quart. J. Exp. Physiol.*, Vol. xx, No. 2, 1930.

The length of the lactation interval in the mice in these experiments is from 20 to 25 days. It is not affected by an artificially induced prolongation of lactation. Removal of the litter at birth, on the 7th day, 14th day, or 21st day of lactation is followed within 2 to 4 days by oestrus in all cases. From a comparative survey of the states of pregnancy, pseudo-pregnancy, and lactation, it is argued that in all the same hormonal conditions prevail.

CREW (F. A. E.) and MIRSKAIA (L.). **The Effect of Removal of the Litter upon the Reproductive Rate of the Female Mouse.** *Quart. J. Exp. Physiol.*, 1930.

CREW (F. A. E.) and MOORE (E.). **Report from Commission II on the Differential Fertility, Fecundity and Sterility.** *Bull. Internat. Union Sci. Invest. Populat. Problems*, Vol. i, No. 3.

CREW (F. A. E.) and SMITH (A. D. B.). **The Genetics of the Horse.** *Biblio. Genet.*, Vol. vi., 1930.

A review of present knowledge relating to the Genetics of the Horse, complete with bibliography.

Crew (F. A. E.) and Wiesner (B. P.). **On the Existence of a Fourth Hormone, Thyreotrophic in Nature, of the Anterior Pituitary.** *Edin. Med. J.* 20th April, 1930.

It is argued from the multiplicity and diversity of the effects of extracts from the anterior lobe of the pituitary that there are at least four hormones elaborated by it.

Greenwood (A. W.) and Blyth (J. S. S.). **The Results of Testicular Transplantation in Brown Leghorn Hens.** *Proc. Roy. Soc. B.*, Vol. 106, 1930.

In a series of normal hens it has been found possible to obtain persistent grafts of testicular substance.

Modifications in the functions of the ovary have been produced, both in regard to the production of eggs and to the development of the secondary sex characters.

The bearing of these results on the divergent theories of Steinach, Sand and Moore with regard to gonad interaction and function is discussed.

Hutt (F. B.). **A Note on the Effects of Different Doses of Thyroid on the Fowl.** *Brit. J. Exp. Biol.*, Vol. vii, No. 1, 1930.

Black Minorca fowls received, in addition to a well-balanced ration, daily doses of desiccated thyroid. All doses were calculated per 100 gms. of body weight. Doses of 4 mg.–2 mg. per 100 gms. of body weight were lethal. Doses of 1·3 mg. to 0·8 mg., caused loss of weight in both sexes, while a dose of 0·57 mg. caused a loss of weight in males, but not in females. All doses caused the production of hen-feathering in males. Depigmentation is evoked by a dose of not less than 0·4 mg., while small doses appear to increase the production of melanin. In the light of these experiments some of the contradictory results of other workers become explicable.

Mirskaia (L.). **On the Genetic Nature of the Time of Attainment of Puberty in the Female Mouse.** *Quart. J. Exp. Physiol.*, Vol. xx. No. 4, 1930.

Mirskaia (L.). **On the Occurrence and Mechanism of Pre-pubertal Mucification.** *Proc. 2nd Internat. Conf. f. Sex Research*, 1930.

Mirskaia (L.). **On the Presence of Kyogenic Substance in the Mouse Placenta.** *Proc. Roy. Soc. Edin.*, vol. 1, Pt. I, 1930.

The mouse placenta implanted into immature female mice evokes pregnancy conditions in the vaginal epithelium, growth of the follicles in the ovary, and enlargement of the interstitial tissue. It is demonstrated, therefore, that mouse placenta contains an active kyogenic substance.

Mirskaia (L.) and Crew (F. A. E.). **On Genital Maturity in an Immature Soma.** *Brit. J. Exp. Biol.*, Vol. vii, No. 3, 1930.

Injection of urine of pregnant women into immature female mice causes a precocious maturity of the genital system, but not a maturation of the organism as a whole. Mating may take place, but pregnancy does not occur. The age at which the first litter is produced is not affected by the injection.

Mirskaia (L.) and Crew (F. A. E.). **Maturity in the Female Mouse.** *Proc. Roy. Soc. Edin.*, Vol. 1, Pt. II, 1930.

A distinction is drawn between the state of puberty, which is characterised by the ability to produce functional gametes, and maturity, which is the stage at which the individual organism is capable of producing and rearing viable offspring. The age at which puberty is reached varies in different

stock. Likewise there are considerable differences in the age at maturity, referable to variation in genetic constitution and in husbandry. Among the material used for this study the albino animals exhibited an earlier onset of puberty, higher fertility after the first mating and a slightly higher interval between the first and the second period of heat than did the coloured ones.

PATEL (J. S.). **Inhibition of Oestrus with Corpus Luteum Extracts.** *Quart. J. Exp. Physiol.*, Vol. xx, No. 3, 1930.

Kythin inhibits oestrus by producing pseudo-pregnancy conditions in the injected mice. The inhibition of oestrus can be obtained for a long period without causing permanent injury to the ovaries.

PICKARD (J. N.). **Die Vererbung von Haarbüscheln und Wollmenge bei Angora-Kaninchen.** *Sond. a. d. Zeit. Zucht.*, Band 5, Heft 8, 1930.

Results of breeding experiments have demonstrated that in the Angora tufting and wool yield are based on single factors. Tufting is dominant over absence of tufting and high wool yield dominant over low yield. The correlation between the two characters is positive and it appears probable that they are linked.

PICKARD (J. N.). **Chinchilla Genetics.** *Fur Farming*, Vol. viii, No. 5, 1930.

An account of the work of Castle and Nachtsheim.

PICKARD (J. N.), BARRITT (J.) and KING (A. T.). **The Effects of Cystine Diet on Keratin Composition in Rabbit Wool.** *Biochem. J.*, Vol. xxiv, No. 4.

Angora buck rabbits have been fed for 3 months on a normal diet and on diets with the addition of varying amounts of cystine obtained from wool hydrolysate.

In general, a large increase in the sulphur content of the fur of individual rabbits has been found between the two successive 3-month periods, January to April, and April to July, in the controls as well as in the cystine-fed animals. The maximum increase observed was 18 per cent., and this occurred with rabbit No. 301 on normal diet throughout.

While the fleece weights are generally less for the shorter second period, the fleece weight ratios for the two periods are substantially the same with the cystine-fed animals as with the controls.

SMITH (A. D. B.). **Litter Size: Is it Inherited?** *Pig Breed. Ann.*, 1930.

SMITH (A. D. B.). **Breeding for Milk: the Need for Milk Records.** 1930.

SMITH (A. D. B.), SCOTT (R. J.) and FOWLER (A. B.). **The Inheritance of Milk Yield in Ayrshire Cows.** *J. Dairy Res.*, Vol. i, No. 2, 1930.

A statistical analysis was made of some 5,000 records in order to determine the effect of various ancestors upon the yield of their female descendants. There was found to be considerable correlation between granddaughters and both grandsires; the correlations were higher for the maternal than for the paternal grandsire. Correlation of granddaughters to the paternal and the maternal granddams was low. Though the results cannot be regarded as conclusive, owing to the many complications, they may be taken as subsidiary evidence that the inheritance of milk yield is sex-linked.

Wiesner (B. P.). **The Hormones and their Control of the Reproductive System.** *Eugen. Rev.*, Vol. 22, No. 1, 1930.

Wiesner (B. P.). **On the Separation of the Kyogenic Hormone from Human Placenta.** *Edin. Med. J.*, Feb., 1930.

An account of the preparation, dosage and effects of this hormone.

Wiesner (B. P.). **On the Reactivation of the Senile Testis of the Rat by Means of Injections of Gonadotrope Hormones.** *Edin. Med. J.*, April, 1930.

The injection of oestrogenic extract from anterior lobe and human placenta causes reactivation of the senile testicle in which spermatogenesis was either completely lacking or greatly reduced. The extracts also induce renewed endocrine function and thus lead to a recurrence of the function of the genital glands which depend on testicular hormone.

Wiesner (B. P.) and Crew (F. A. E.). **The Gonadotrope Actions of the Anterior Lobe of the Pituitary.** *Proc. Roy. Soc. Edin.*, Vol. 1, Pt. I, 1930.

An examination of the relation between gonad and the other endocrine glands.

Wiesner (B. P.) and Mirskaia (L.). **On the Endocrine Basis of Mating in the Mouse.** *Quart. J. Exp. Physiol.*, Vol. xx, No. 3, 1930.

No mating was observed in untreated ovariotomised mice.

Mating was induced in ovariotomised mice by injections of follicular juice, but injections of aqueous extracts from this material did not induce mating.

Mating was induced in eleven out of twenty ovariotomised mice by injections of cornifying extracts prepared from pregnancy urine.

Mating is assumed to be an effect of the cornifying *a*-factor conditioned by a higher threshold than cornification.

The relation of the thresholds is discussed with reference to its possible variation.

Questions of terminology are discussed and the term *a*-factor or Allen-Doisy factor is adopted.

ROWETT RESEARCH INSTITUTE, ABERDEEN.

Auchinachie (D. W.), Macleod (J. J. R.) and Magee (H. E.). **Studies on Diffusion through Surviving Isolated Intestine.** *J. Physiol.*, 1930, **69**, 185.

A method is described for studying the rate of diffusion of solutes from the lumen of surviving segments of mammalian intestine.

Soluble substances diffuse more rapidly through dead intestinal segments suspended in isotonic saline solutions than through living segments. The difference is due to physical changes in the walls of the segments. The living segments nevertheless exhibit the property of selective absorption.

McCallum (J. W.) and Magee (H. E.). **The Influence of Bicarbonate and Phosphate on the Movement of Surviving Intestine.** *Quart. J. Exp. Physiol.*, 1930, **20**, 21.

The effects of change in the bicarbonate and phosphate content of Tyrode's fluid at 38° on the pendular movements of surviving segments of ileum from rabbits which had fasted for 15 hours are recorded. Sodium bicarbonate

independently of its alkalinity and its buffering action beneficially affects the whole contractile process. The immediate effect of phosphate proved to be variable.

MAGEE (H. E.) and MACLEOD (J. J. R.). **Diffusion through the Walls of Surviving Intestine.** *Amer. J. Physiol.*, 1929, **90**, 442.

This is a preliminary communication to the International Physiological Congress on the work published in J. Physiol., 1930, **69, 185** (*see* above).

SUN (T. P.) and MACOWAN (M. M.). **Changes in Parathyroid and Adrenal Glands and in Blood Calcium in Relationship to Egg Formation in Fowls.** *J. Physiol.*, 1930, **70**, iv.

A close relationship was found to exist between the weight of fowls' eggs in oviduct and their blood calcium and a more general one between the egg weight, adrenal weight and the structure of the parathyroid. The bigger the egg the more marked were the changes in the parathyroid which consisted in distortion of the epithelial columns, increase of connective tissues and vacuolation of the cytoplasm.

(N) ANIMAL NUTRITION.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

Jones (Martin G.) and Jones (Ll. Iorwerth). **The effect of varying the periods of rest in rotational grazing.** *Welsh Plant Breed. Sta. Bull.*, Series H, No. 11, p. 38, June, 1930.

This paper gives the results of two years' work on the effect of grazing management on a pasture. A field was divided into three areas in the Spring of 1928—on one area the pasture was rested for four days, another area a fortnight, whilst the third area was rested a month between successive grazings.

The first part of the article gives the animal production of the three pastures measured in pounds live weight increase of sheep—the pasture receiving a month's rest giving the best result both in live weight increment and the sheep carrying capacity. A comparison is also made of the behaviour of the sheep on these pastures, showing that the sheep spent less time grazing and more time resting on the pasture receiving a month's rest than the other two pastures.

The second part of the article gives the result of the sheep grazing management on the pasture :—

(*a*) the effect of the length of rest period on the early growth of the following Spring—the area receiving a month's rest between successive grazings giving an earlier growth in the following Spring as compared to the other two pastures.

(*b*) the effect of management on the botanical composition of the pastures—a comparison is made of the effect of management on different species of grasses and weeds, on different strains of the same species and also the moss content of the pastures.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

Cruickshank (E. M.). **Some Recent Research in the Nutrition of Poultry.** Paper read at the Annual Poultry Conference, Harper Adams College, 1929.

A semi-popular paper dealing with the efficiency of the hen as a physiological machine.

The changes taking place in certain constituents of the blood and tissues, viz., calcium, phosphorus and iodine during growth, egg-production and moulting are also discussed, and the probable relation of these changes to the different physiological activities of the fowl is indicated.

Cruickshank (E. M.). **Minerals in Relation to Poultry Nutrition.** *Lancs. Utility Poultry Soc.'s Rep.* 1930, Vol. 4, No. 4, p. 15.

A popular article indicating the rôle played by minerals in the nutrition of the fowl.

(1) The occurrence of minerals in the body of the fowl and in the egg-material.

(2) Physiological changes associated with the calcium during egg-production.

(3) Practical experiments relating to the effect of minerals on egg-production.

CRUICKSHANK (E. M.). **Observations on the Iodine Content of the Thyroid and Ovary of the Fowl during the Growth Laying and Moulting Periods.** *Biochem. J*, xxiii, 1929.

(1) The thyroid weight and total thyroid iodine increase in proportion to body weight in the growing bird.

(2) There is a seasonal variation in thyroid weight, the average from mid-March to mid-July showing a loss of 35 per cent. as against January to March.

(3) The seasonal variation in both percentage and total iodine tends to follow the seasonal variation in thyroid weight, which is in contrast to the findings of previous workers on mammals. It is suggested that this variation is connected with the output of iodine during the period of maximum egg-production, since the yolk of egg contains appreciable amounts.

(4) The histological appearance of the thyroid suggests a state of relatively great activity in the immature bird, and of relative inactivity in the laying and moulting birds.

CRUICKSHANK (E. M.). **Factors Influencing the Size and Iodine Content of the Thyroid in Fowls.** *4th World's Poultry Cong.*, 1930.

The thyroid plays an important part in growth and development and in the regulation of the energy metabolism.

The activity of the glands is measured by its iodine content, since thyroxine —the active principle—contains iodine. Factors affecting the size and iodine content are:—

(1) Food.—The feeding of iodine-rich substances will markedly increase the iodine content of the gland.

(2) Age.—The thyroid weight and iodine content increase in proportion to body weight in the growing bird, the maximum being reached at sexual maturity.

(3) Species.—The weight of thyroid per kilogramme of body weight, the percentage of iodine, and the total thyroid iodine are higher than in mammals.

(4) Seasonal Variation.—The thyroid shows a marked seasonal variation, the average from mid-March to mid-July showing a loss of 35 per cent. as against January to March. The variation in both percentage and total iodine tends to follow the variation in weight. This variation is correlated with the output of iodine during egg-production.

EVANS (R. E.). **Protein and Mineral Metabolism in Pregnant Sows on a Normal or High-Calcium Diet compared with a Calcium-Deficient Diet.** *J. Agric. Sci.*, xix, 752–798, 1929.

The physiological effects of calcium-deficiency on pregnant sows are briefly described. The storage of nitrogen, ash, lime, phosphate, sodium and potassium at various stages of gestation was determined both on a lime deficient group in the second generation of calcium deficiency, and also on another group on the same ration but with the addition of calcium carbonate. The storage of these elements in the foetus was computed and the influence of calcium deficiency on the blood-picture was investigated.

EVANS (R. E.). **The Influence of the addition of Calcium Carbonate to a ration low in Lime on the appetite and digestibility of the food in Swine.** *J. Agric. Sci.*, xix, 799–801, 1929.

The animals used were in the second generation of calcium deficiency and the influence of lack of calcium, in an otherwise satisfactory diet, on food consumption is described. Twenty-two digestion trials were undertaken

to investigate whether the digestive mechanism of the animal becomes impaired under prolonged calcium deficiency and whether the beneficial effects obtained on the addition of lime might be partly ascribed to a more complete utilisation of the organic constituents of the food.

EVANS (R. E.). **The Influence of a Low or High Calcium Diet on the Development and Chemical Composition of the Skeleton in Swine.** *J. Agric. Sci.*, xx, 117–125, 1930.

The bones of the animals used in the above investigations were examined chemically to determine to what extent the deficiency of lime in the ration had impaired the development and calcification of the skeleton. The bones were divided into four distinct groups and the influence of maturity and low-line rickets on the composition of the skeleton was investigated.

FOREMAN (F. W.). **Further Developments of Rapid Volumetric Methods for the Determination of Amino-acids, Organic Acids and Bases. I.** *Biochem. J.*, xxii, No. 1, 1928.

Rapid accurate determination of ammonia or ammonia and volatile amines in fluids of biological interest, and the determination of the different classes of acid radicles represented in the total alcohol titration value.

On applying the alcohol titration method for amino acids (Foreman, 1920) exactly as if estimating amino acids alone, to fluids of biological interest, it is shown that the result represents accurately a collective measure of the acid radicles in amino acids, free acids, salts of ammonia or primary, secondary and tertiary amines. Hitherto such reliable total estimates have been unattainable. New methods which avoid undesirable changes in any of the constituents are described whereby these total values may be differentiated rapidly into class values and the accuracy of the estimates checked by balance sheet processes. New class estimates not hitherto possible are obtained. Consequently it is now possible to follow satisfactorily important changes occurring in foods, whether due to bacteria, enzymes or hydrolysis, during digestion and other physiological processes, in the growth of plants, in ripening and germination and in many other problems of agricultural, medical and hygienic importance.

FOREMAN (F. W.). **Further Developments of Rapid Volumetric Methods for the Determination of Amino-Acids, Organic Acids and Bases. II.** *Biochem. J.*, xxii, No. 1, 1928.

Rapid quantitative removal and determination of the carbonic acid radicle, especially in bacterial cultures, without exposing other constituents to risk of loss or change.

A new simple rapid room temperature process for estimating and eliminating the carbonic acid radicle from fluids such as bacterial cultures, based on the behaviour of the constituents in alcohol as described. An application of this method prior to those described in the foregoing paper (Foreman, 1928, 1) gives greater precision in the results of the latter and facilitates their interpretation. It seems possible that the new principle established in evolving this process will prove of much wider analytical usefulness.

HALNAN (E. T.). **Feeding Standards for Dairy Cows.** *J. Dairy Res.*, 1, 1929.

A monograph on the feeding standards for dairy cows. An historical introduction on the evolution of feeding standards is followed by a critical survey of the research work on the maintenance and production requirement of dairy cows carried out in Europe and America. On the evidence given in

the monograph it is suggested that a suitable standard for milk production would be:—

(1) For maintenance of the 1,000 lb. cow; 5,446 cals. net energy, or 5 lb. S.E., containing 0·5 lb. digestible protein or 0·6 lb. protein equivalent.

(2) For the production of 1 gallon of 4 per cent. fat milk: 2·5 lb. S.E. or 2,777 cals. net energy, containing 0·48 lb. digestible pure protein or 0·57 lb. protein equivalent.

Based on Andersen's formulae, the requirements for milk of various fat percentages on the basis of these findings are given.

HALNAN (E. T.). **The Role of Fibre in Poultry Feeding.** *4th World's Poultry Cong.*, 1930.

A common characteristic of poultry foods is the presence of "crude fibre." The extent to which this enters into poultry feeding-stuffs is discussed and reasons are adduced, supported by experimental evidence, to show that this nutrient is not digested to any great extent by the bird. The work of Mangold and others on the part played by the caeca in the digestion of woody fibre by the bird is shortly summarised. Two diagrams are given which illustrate (*a*) the slight extent to which the fibre is utilised by poultry; (*b*) the depressant effect of the presence of fibre in a feeding stuff on the digestibility of the organic matter. In addition, evidence is given showing that the digestibility of the N-free extract of feeding stuffs also appears to be affected. The conclusion is reached that fibre is an undesirable ingredient of poultry foods from a nutritive standpoint, but its inclusion can be justified as a regulator of the amount of food eaten daily by poultry. Data are given showing the way in which this regulation is effected in practice.

HALNAN (E. T.). **Feeding for Egg Production.** *Lancs. Utility Poultry Soc. Yr. Bk.* 1930.

A popular article on the scientific feeding of poultry for egg production. From a comparison of the analysis of the laying pullet and the composition of 200 eggs it is inferred:—

(1) That the requirements for egg production of a pullet in heavy production must be supplied in the food.

(2) That high egg production on a ration consisting largely of cereals is only possible if the ration is supplemented by the addition of protein, and mineral supplements in the form of oyster shell or limestone and common salt.

MANSFIELD (W. S.) and SANDERS (H. G.). **The Desirability of Succulence in the Winter Ration of Dairy Cows.** Milk Recording. *Central Council of Milk Rec. Soc. Yr. Bk.*, 1930.

A popular account of a feeding trial carried out at Cambridge, with a brief general discussion.

In carrying out the trial in question, the object of which was to answer the question "are roots beneficial in a well balanced ration?", the yields of milk were standardised in respect of the four factors (other than feeding and management) which affect the lactation yield, namely, the month of calving, the length of the interval between calving and service, the age of the cow and the length of the dry period preceding lactation. The trials were carried out over a period of three years with successive lots of cows, and the method used enabled a comparison to be made, in the case of each cow, of the yield of milk obtained by hay feeding and the yield obtained by root feeding. Trials were carried out on two farms and a drop in milk yield was associated with the dry feeding in both cases; the conclusion was reached that, where other conditions are constant, succulent food raises the milk yield from 5 per cent. to 10 per cent. as compared with dry food.

SOUTHGATE (B. A.). **The Maintenance Requirement of the Fattening Cockerel, with a note on a proposed new method for the determination of the surface area of birds.** *J. Agric. Sci.*, xx, 1930.

Twenty Light Sussex cockerels were fed by the Sussex fattening methods on variable amounts of a mixture of Sussex ground oats and dried milk, and their maintenance requirements estimated by the comparative slaughter method, using the equation $R = Am + gc$ evolved by Wood and Capstick. The maintenance requirement found was 22·1 calories per sq. m. of surface. A new method of ascertaining the surface area of birds is described by Halnan and Southgate, the method being based on the capacity of the skin to absorb chemical substances (potassium permanganate) when applied to it. The value for K in the equation Area $= K \times W^{\frac{2}{3}}$ was found by this method to be 9·3.

WOOD (the late T. B.) and NEWMAN (L. F.). **Beef Production in Great Britain.** (Copies of this may be obtained through a Bookseller.)

This brochure contains the results of several years' experimental work on the food value and butchers' points of beef carcases. The work was begun on three young animals to determine the composition and the butchers' value of baby beef and subsequently was much extended by the further examinations and analysis of two series of animals during fattening period. Messrs. R. Silcock and Sons, Stanley Hall, Union Street, Liverpool, invited the authors to write up their analytical results and general investigations into a paper, which the firm generously published at their own expense.

The arrangement of the work falls into three parts, the first being a general discussion on beef production in England with statistics on the fattening and general management of beef cattle in connection with grassland and with indoor feeding. The second part considers the bullock from the butcher's point of view and contains a number of comparative tables on weights of joints and of organs, while part three contains detailed analytical results and weights of a number of animals slaughtered at different stages of fattening. This part is illustrated by photographs of the chief joints (London cut) into which the side was divided for analysis, with short descriptions of the anatomy and culinary value of the cuts, and contains a coloured plate illustrating the way in which a side of beef is divided. The records and results of much laborious and useful analytical work is available in the tables and photographs to those interested in beef production, and the changes in relative values of the joints of beef animals during the fattening period and at different ages can be followed through the three series of animals.

WOODMAN (H. E.). **Recent Advances in Animal Nutrition.** *Sci. Prog.*, xxiv, Jan., 1930.

A review of recent research on the following problems: (i) The yield of pastures; (ii) Minerals in Pastures; (iii) Beef Production; (iv) The digestibility of poultry rations in relation to the bulk of the ration; (v) The digestion of cellulose by ruminants; (vi) High protein diet and renal disturbance in sheep; (vii) Tapioca meal and pig-feeding; (viii) Sugar beet pulp and whole sugar beet in pig-feeding; (ix) Sugar beet pulp as a source of pectin.

WOODMAN (H. E.). **Rations for Livestock,** by the late T. B. Wood, revised for the Sixth Edition (1930). *Min. Agric. Misc. Pub.*, No. 32.

WOODMAN (H. E.). **The Composition, Feeding Value and Uses of the Sugar Beet By-Products.** *Rep. 3rd Conf. Sugar Beet Problems held at Harper Adams Agric. Coll.*, April, 1930.

Woodman (H. E.), Bee (J. W.) and Griffith (G.). **Nutritive Value of Pasture: V. Pasture Grass Conservation: The Influence of Artificial Drying on the Digestibility of Pasture Herbage.** *J. Agric. Sci.*, xx, 53, 1930.

The recognition of the protein-concentrated and highly digestible character of young leafy pasturage has led to proposals for conserving such herbage for feeding to farm animals during the winter as a substitute for oil cakes. Before contemplating the adoption of such proposals on a commercial scale, however, it was necessary to demonstrate that young pasturage could be dried artificially without losing its highly digestible nature.

That this is possible is clear from the results brought forward in this publication. It is shown that young grass does not suffer any depression in respect of digestibility when it is dried (*a*) at the temperature of steam, or (*b*) by direct heat in a kiln.

Woodman (H. E.), Duckham (A. N.) and French (M. H.). **The Value of Dried Sugar Beet Pulp and Molasses-Sugar Beet Pulp in the Nutrition of Swine.** *J. Agric. Sci.*, xix, 656, 1929.

Pigs are able to digest dried sugar beet pulp and molasses-beet pulp to an extent very little inferior to that to which ruminant animals are able to digest these feeding stuffs. Despite this finding, however, beet pulp is by no means an entirely suitable food for pigs. Its inclusion in pig rations, even to the moderate extent of one-quarter of the barley meal, or, alternatively, one-half of the middlings, causes the mixed food to be very bulky after soaking. This leads to difficulty in securing satisfactory consumption of the food, the animals being unable to consume as big a ration as is possible when sugar beet pulp is omitted. The rate of gain of live-weight is depressed as a consequence.

Dried sugar beet pulp should not be included in the rations of pigs designed for early maturity. There is no reason, however, why it should not be used in moderate amounts in the rations of breeding stock, or for cheapening the ration of bacon pigs which are not being fed with a view to securing the quickest possible rate of live-weight gain.

Woodman (H. E.), Duckham (A. N.) and French (M. H.). **The Value of Whole Sugar Beet in the Nutrition of Swine.** *J. Agric. Sci.*, xix, 669, 1929.

Though it is neither customary, nor perhaps desirable during the period of the sugar beet subsidy, to utilise sugar beet for feeding purposes, it is conceivable that circumstances might arise occasionally when a farmer would be desirous of feeding at least a part of the beet crop. The following conclusion, in respect of the feeding value of sugar beet, has been drawn from the results of digestion and farm-feeding trials:

Whole sugar beet, suitably grated, is an excellent substitute for barley meal, up to one-quarter of the total ration, in the production of bacon pigs. The substitution should be effected at the rate of 3½ lb. of grated sugar beet for 1 lb. of barley meal.

Woodman (H. E.), Mansfield (W. S.) and Garner (F. H.). **Molasses Sugar Beet Pulp as a Food for Fattening Cattle.** *Rep. to Min. Agric. and Fish., July*, 1930, *on a feeding trial carried out at the University Farm during the winter of* 1929–30.

The feeding trial led to the following conclusions:—

(*a*) Molasses beet pulp is equal in feeding value to bruised oats when fed, pound for pound, to mature fattening cattle.

(*b*) As much as 15 lb. of molasses beet pulp was fed per head per day with successful results and without causing "scouring". The effect of a ration containing a similar allowance of oats was slightly laxative, owing, in all probability, to the relatively high oil content of the oats.

(*c*) No marked differences were observed between the carcases of the bullocks fed on molasses beet pulp and those fed on oats. The meat in both cases proved of satisfactory quality and flavour.

DEPARTMENT OF ANIMAL PATHOLOGY, CAMBRIDGE.

STEWART (JAMES). **A Study of Nitrogen Metabolism in Sheep on High Protein Diet.** *J. Agric. Sci.*, Vol. xx, Pt. I, 1930, p. 1.

This paper records experiments designed to show changes in the metabolism of sheep exhibited by nitrogen balances and weight curves during excessive protein feeding. Evidence is adduced of the unreliability of short period balance experiments and the care necessary in the interpretation of such results.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

GOLDING (J.) and HALLETT (H. S.). **Proximate Chemical Analyses of Pastures from Plots manured with Sulphate of Ammonia.** *Ann. Appl. Biol.*, **17**, 1, Feb., 1930.

The analytical work which was begun in 1926 and is still in progress involves the chemical examination of samples of grass taken from all over the plots (2 experimental and 2 control) at the beginning of grazing. Marked differences were found between the protein content of the dry matter of the grass from the manured plots and that of the unmanured plots in the early spring and after the summer rains.

ROWETT RESEARCH INSTITUTE, ABERDEEN.

DAVIDSON (H. R.). **The Value of Grazing for Fattening Pigs.** *Scott. J. Agric.*, 1930, **13**, 288.

Several factors are involved in the grazing of pigs, many of them advantageous, some of them not. In the case of breeding pigs nearly all of the advantages are effective, and the disadvantages do not, as a rule, apply.

In the case of fattening pigs results indicate that when a ration is otherwise properly balanced the addition of green food makes little if any difference. When young pigs are grazed for a few weeks after weaning, however, the advantages of exercise and exposure to fresh air and sunlight lead to an improvement in constitution which is reflected in relatively increased gains when the animals are fattened inside.

Where green food must be consumed as being the cheapest available foodstuff, it may be fed at a rate not exceeding an average of about 6 lb. per head daily.

DUTHIE EXPT. FARM. **Surplus Potatoes: The Use of Potatoes and Oats as Feeding Stuffs.** *Scott. J. Agric.*, 1930, **13**, 30.

At current prices potatoes and oats can be used to a large extent in making up rations for pigs and cattle, provided the rest of the ration is suitable. Potatoes should be supplemented by foodstuffs rich in protein. For cattle, potatoes can be utilised raw but for pigs utilisation is increased by cooking. Oats have lower food value than the average of other cereals on account of higher percentage fibre and this limits the amount which can be fed to young

pigs. For the latter crushed oats can be used up to one-third of ration. For milk cows, if balanced up with protein and a mineral mixture oats can be fed up to 75 per cent. of the production ration. Potatoes can be used up to 12 lbs. per head per day.

KELLY (F. C.) and HENDERSON (J. M.). **The Influence of Certain Dietary Supplements on the Nutrition of the African Native, I, II and III.** *J. Hyg. Camb.*, 1930. **29**, 418, *et seq.*

These three papers give an account of the work on native dietetics carried out in Kenya Colony. The work was done on prisoners and on growing East African Native boys. The prison diet was found to be deficient in calcium and the addition of a mineral supplement (containing calcium) to the diet or of a small dose of cod liver oil produced a distinct improvement in body weight. The addition of olive oil plus iodine produced a like result but less in degree. In experiments with native boys most of them were found to be on a negative calcium balance. The diet was found to be low in calcium and the negative balances became positive on the addition of calcium, as milk, or in a mineral mixture, with or without cod liver oil.

LEEPER (G. W.). **Notes on the Thiocyanate Method of Estimating Iron. Influence of Different Classes of Phosphates.** *Analyst*, June, 1930.

Attention is drawn to the fact that phosphates, if present in any appreciable quantity, are likely to interfere with the colorimetric estimation of iron in foodstuffs by the thiocyanate method. This is due to the formation of meta- or pyrophosphates during ashing, traces of these being sufficient to interfere with the formation of the red colour of ferric thiocyanate. A method for avoiding this difficulty is outlined.

MCGOWAN (J. P.). **The Absorption and Excretion of Iron by the Intestine and the Nutritional and Therapeutic Value of its Salts.** *Edin. Med. J.*, 1930, **37**, 85.

Where food contains "organic" iron only, any iron found in the intestinal walls is "excretory"; if food contains "ionic" iron, some of it will be "excretory," some absorbed "ionic," and some absorbed "ionic" being excreted by a short circuit. It seems likely that, in the absorption of "ionic" iron, the functioning mechanism is still the excretory one acting as a reversible process. The idea that, while absorption of iron takes place solely by the duodenum, excretion is limited to the large intestine, does not appear to be correct. The possible function of copper in aiding haemoglobin formation is discussed.

MAGEE (H. E.). **The Role of the Small Intestine in Nutrition.** *Physiol. Rev.*, 1930, **10**, 473.

This is a review of the literature on the physiology of the small intestine in relation to nutrition. The major portion of the article is concerned with problems of absorption, but the digestive and motor functions of the small intestine also receive attention.

ORR (J. B.). **The Influence of Diet on the Susceptibility to Disease.** *Trans. Highl. Agric. Soc. Scot.*, 1930, **42**, 28.

A review article in which is discussed the relationship of diet to disease. It is now recognised, as a result of experimental work and clinical observation, that the diet, especially in relation to vitamins, inorganic elements and quality of protein, has a profound influence, not only on growth and reproduction, but also on health. It is now possible to attribute certain

diseases solely to errors in the diet and there is evidence to show that in the case of some other diseases, though dietary errors are not the sole cause, they are important contributory causes in rendering animals more susceptible.

Orr (J. B.) and Clark (M. L.). **A Report on Seasonal Variation in the Growth of School Children.** *Lancet*, 1930, **219** (2), 365.

Children to the number of 657, aged from 7 to 11 years, from four Scottish towns were measured and weighed in quarterly periods. They showed a very much greater increase in height in the three months from the end of March to the end of June than in any other period, and the smallest increase in height in the months of October, November and December. The weight increase was greatest in the quarter July, August, September; second greatest in the quarter October, November, December. In the early summer quarter (April, May, June) about 25 per cent. of the boys actually lost weight although increasing in height.

Orr (J. B.) and Clark (M. L.). **A Dietary Survey of 607 Families in seven Cities and Towns in Scotland.** *Lancet*, 1930, **219** (2), 594.

In the course of the experiments on feeding milk to school children, a survey was made of the dietaries in the households from which the children were drawn. The daily intake per person was estimated for protein, fat, carbohydrate, calcium, phosphorus and iron. The results of the survey indicate that the diets were on the whole adequate as regards energy value. When considered as regards adequacy to support optimum growth, however, it was found that they were poor in protein and still poorer in the minerals estimated.

Orr (J. B.), Crichton (A.) and Middleton (W.). **A Note on the Toleration of Farm Animals for High Doses of Iodine.** *Vet. Rec.*, 1929, **9**, 1055.

Experiments were carried out with different classes of farm stock to determine the level of iodine feeding which could be maintained without producing harmful effects. From the results it would appear that doses of iodine up to 3 grams a day in the case of calves, 5 grams in pigs and 0·3 grams in sheep and poultry can be administered over long periods without harmful effects on health or rate of growth. There is no evidence to show, however, whether or not these doses, if continued throughout the life cycle of the animal, would affect breeding capacity.

Orr (J. B.) and Davidson (H. R.). **Observations on the Nutrition of Breeding Pigs.** *Pig Breed. Ann.*, 1930, p. 53.

Results are given of experiments with breeding pigs to show that a deficiency of lime in the ration increases the number of pigs born dead. Before addition of lime to the ration the average number of pigs farrowed was 7, of which 2½ on the average were alive at weaning. After the addition of lime the average number farrowed was 10, of which 7½ on the average were weaned. The main effect of deficiency of protein was a retardation of growth. The authors conclude that the better a ration is balanced with regard to protein the more important it becomes to see that the mineral and vitamin requirements are satisfied.

Richards (M. B.). **The Colorimetric Determination of Manganese in Biological Material.** *Analyst*, Sept., 1930.

The periodate method of Willard and Greathouse for the colorimetric estimation of manganese can be applied to the estimation of very small amounts of manganese, such as occur in biological material, if due care be taken to drive off all chlorides before oxidation, and to see that the acidity of the solution does not exceed 15 c.c. of sulphuric acid per 100 c.c. of solution. It is recommended, for reasons given, that the acidity be kept

about 5 to 6 per cent., unless it is found that very considerable amounts of manganese are present. It has been shown that the method gives satisfactory results, both as regards agreement of parallel determinations and as regards recovery of added manganese from the samples analysed.

CHEMICAL AND ANIMAL NUTRITION DIVISION, MINISTRY OF AGRICULTURE, NORTHERN IRELAND.

PRENTICE (J. H.), BASKETT (R. G.) and ROBERTSON (G. S.). **The Nutrition of the Chick and its effect on Growth, Maturity, Egg Production and Mortality.** *Conf. Paper (Sect. B) World's Poultry Cong.*, 1930.

Recent research work on poultry nutrition in Northern Ireland is reviewed in this paper. It is shown that nutrition has a far greater influence than is generally realised on growth and development, mortality, the profitable disposal of the surplus cockerel, and the number and size of eggs produced by the pullet.

The experiments described show:—

(1) That the addition of minerals to a cereal ration for young chicks almost doubles the rate of growth, reduces mortality and the time required by the pullet to reach maturity and raises the profit over cost of feed for the surplus cockerel from 1½d. per bird to 2s. per bird.

(2) That the addition of separated milk to a cereal ration more than doubles the rate of growth, greatly reduces mortality and the age at first egg of the pullet and raises the profit over cost of feed for the surplus cockerel from 1½d. per bird to 2s. 1d. per bird.

(3) That an addition of 18 per cent. Soya Bean Meal (Ext.) plus 4 per cent. of a mineral mixture to a cereal ration results in a rate of growth comparable with that obtained by feeding separated milk and cereals.

(4) That the mineral content of a ration for growing chicks is of fundamental importance.

The paper claims that the success of intensive fattening plants depends upon the supply of store chickens and that it is more economical to produce a fat chicken by the use of a proper rearing ration than to rely upon a course of intensive fattening prior to killing.

BAIRD (J. C.) and PRENTICE (J. H.). **Changes with age of the Hydrogen Ion Concentration of Egg White and Egg Yolk and of the Refractive Index of the Egg White.** *Analyst.* Jan., 1930.

The quinhydrone electrode designed by Biilman was found satisfactory for making the pH determinations.

In freshly laid eggs the pH of the white was 7·63, that of the yolk was 6·0. The former figure changed rapidly during the first week and thereafter remained constant at approximately pH 9·0.

The pH of the yolk was not quite constant but rose very gradually.

The refractive index of the white was constant at a figure of 1·360.

The pH of white or yolk or the refractive index of the white is of no commercial value for determining the age of eggs.

(O) DAIRYING.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

BARTLETT (S.). **Milk Secretion and Milking.** *Berks. Milk Rec. Soc. Hdbk.*, 1928–29.

The secretion of milk is continuous, but is most rapid immediately after milking with a reduction in the rate of secretion as milk accumulates in the udder. The udder of a properly milked cow still contains a small quantity of milk and the less efficient the milking the larger is the quantity of milk retained by the cow. Variation in the quality and quantity of milk may be considered under two headings:—

(1) Those causes which affect the speed at which milk is secreted between milking times, such as feeding, health, etc.

(2) Those causes which tend to induce a cow to hold up a proportion of her milk at milking times, such as inefficient milkers and erratic treatment of cows during milking hours. The latter causes are likely to influence the quality as well as the quantity of milk.

CRAWFORD (M. E. F.), GOLDING (J.), PERRY (E. O. F.) and ZILVA (S. S.). **The Fat-soluble Vitamins of Milk.** *Biochem. J.*, **24**, 3, 682–91, 1930.

The results obtained in these experiments suggest definitely that the entire vitamin A and vitamin D content of milk is associated with the milk-fat. There are no indications that these vitamins are more concentrated in one fraction of the milk fat than in another, nor that there is significant loss in either vitamin due to separating or churning, and consequently by testing the butters it is possible to obtain the approximate relative potency of milks. These experiments further suggest the utility of the Soames and Leigh-Clare method for the determination of vitamin D.

DAVIES (W. L.). **Action of Strong Sunlight on Milk.** *Milk Industry*, July, 1930.

Attention is drawn to the possibility of fat deterioration in milk through the activation of the dissolved oxygen by strong sunlight. The concept of the biological and chemical oxygen demands in milk is advanced with a view to explain the occurrence of fat taints generally in milk through agents capable of activating dissolved oxygen. The actinic rays of sunlight are capable of causing an oily flavour in milk in this way. Precautions necessary to prevent taint formation are discussed.

DAVIES (W. L.). **Fishiness in Dairy Products.** *Proc. Ass. Econ. Biol. Ann. Appl. Biol.*, **17**, 1, 167–9, Feb., 1930.

The mechanism of fat breakdown by auto-oxidation is discussed together with a description of the agencies capable of shortening the induction period and accelerating the breakdown after oxidation has commenced. The behaviour of the fat in dairy products under the same conditions is described with special reference to the initial breakdown of the active lipoid, lecithin, to yield trimethylamine which confers a fishy taint to the product. Other factors governing fat deterioration, namely, moisture content, acidity and growth of micro-organisms are discussed.

DAVIS (J. G.) and MATTICK (A. T. R.). **Rusty Spot in Cheddar and other Cheese. I. Description of the Causative Organism.** *J. Dairy Res.*, **1**, 1, Nov., 1929.

A review of previous work on organisms causing rusty spot in cheese is given. The organism causing rusty spot in Cheddar cheese has been isolated

and described. It has been shown to be an anaerobe, only forming pigment under certain conditions. The organism appears to be one of the true lactic acid bacteria, which, under certain favourable conditions, is able to produce pigment in Cheddar cheese.

DAVIS (J. G.) and MATTICK (A. T. R.). **Rusty spot in Cheddar and other Cheese. II. Factors controlling the pigment of the causative organism.** *J. Dairy Res.*, 1, 2, May, 1930.

It has been observed that media containing tissue extracts promote pigmentation of the organism causing rusty spot in cheese. Growth, but not pigment, may be obtained in a medium containing a fermentable carbohydrate and a suitable protein digest. The substance in tissues promoting pigmentation has properties similar to those of vitamin B. In addition to these chemical requirements, moisture and surface in a medium greatly stimulate pigmentation. Pigment is only produced when the medium is at an oxidation-reduction potential below that at which litmus is reduced. The following factors appear to govern the growth and pigmentation of this organism: (1) a certain range of oxidation reduction potential; (2) moisture; (3) surface; (4) a fermentable carbohydrate; (5) a minimum concentration of soluble available N; (6) a factor closely associated with, but not identical with, vitamin B_1. Certain properties of the factor are described. The relation of this investigation to rusty spot in cheese is discussed.

DAVIS (J. G.) and MATTICK (A. T. R.). **The Cultural Characteristics and Metabolism of the Organism causing "red spot" in English Hard Cheese.** *Zbl. Bakt.*, ii, 80, 1930.

This paper is a brief description of the chemical aspects of the metabolism and pigment of the organism.

HOY (W. A.). **What is marketable milk?** *Essex F.U. Yr. Bk.*, 1930.

The term marketable should carry with it a guarantee of keeping quality for a period of not less than 24 hours after delivery to the retailer. If a given bacteriological standard is maintained it is possible to estimate the length of time that the milk will remain sweet.

MATTICK (A. T. R.). **Phenols in Sterilised Milk.** *Analyst*, 55, Jan., 1930.

Numerous samples of commercial sterilised milk having a flavour and smell strongly suggestive of phenols were found to contain p-cresol. This fault was found to be due to the presence of spore forming organisms which had survived the sterilisation process and were able to produce either p-cresol or phenol by the degradation of tyrosine.

MATTICK (E. C. V.) and HALLETT (H. S.). **Studies in Lactation. I. Variations in some Chemical and Physical Properties of the Milk from Individual Quarters of a Cow.** *J. Dairy Res.*, 1, 1 Nov., 1929.

Various properties of the milk from individual quarters of a single cow during a complete lactation period of eleven months have been investigated. It has been shown that distinct variations were found in certain properties of the milk, particularly in the amount yielded, the acidity, the time of coagulation with rennet and the percentage of butterfat. On the whole the properties of the milk from the two front quarters seem to be similar, and those of that from the two hind quarters, although there are distinct differences between the milk from the fore and hind quarters. On occasions strikingly different values were obtained for the milk from any one quarter which seemed to bear no relationship to the values for the remaining three.

Moir (G. M.). **Pasteurised Milk for Cheddar Cheese-making. I.** *J. Dairy Res.*, **1**, 2, May, 1930.

With a view to a chemical study of the ripening of cheese made from pasteurised milk, two sets of three loaf Cheddar cheese were made from clean milk and from market milk, respectively, so that in each set there was one cheese made from raw milk, one from milk flash-pasteurised at 165° F., and one from milk flash-pasteurised at 185° F. Analyses of the whey drawn from each cheese showed a tendency, especially with market milk of lower hygienic quality, for pasteurisation to cause more of the soluble milk proteins to be incorporated in the cheese. When acidity developed rapidly in the whey after cutting, the resulting cheese was depleted of a proportion of its mineral constituents. The cheese made from pasteurised milk developed a bitter flavour which was very pronounced in those made from the milk heated to the higher temperature. The chemical analyses showed, that in both sets, pasteurisation reduced the quantity of ultimate decomposition products which were formed during the process of ripening.

Moir (G. M.). **A note on the Economic Aspects of the Pasteurisation of Milk for Cheese-making.** *Ann. Appl. Biol.*, **17**, 1, Feb., 1930.

Although pasteurisation of milk for cheese making may be of great benefit to the industry yet in the end it may intensify defects. Pasteurisation may prove a very good stopgap, but when the fundamental problem—the improvement of the bacteriological content of the milk supply—has received due attention it is quite likely that it will be possible to make the best cheese from raw milk that has been obtained under satisfactory hygienic conditions.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

Sanders (H. G.). **The Analysis of the Lactation Curve into Maximum Yield and Persistency.** *J. Agric. Sci.*, xx, Pt. 2, 1930.

It is urged that lactation yield is not a single entity, and that further progress towards the solution of the physiological problem can only be made by analysing it and studying its components separately and then in conjunction with one another. Maximum yield and persistency are physiologically negatively correlated, but this is obscured by genetical factors between cow and cow, and by nutritional factors between herd and herd. The effects of month of calving, service period, age, and dry period on them are quite different, and increased precision in standardisation can be obtained by varying correction factors according to the level of persistency; this, however, would make a full correction table very unwieldy. Throughout an individual cow's life standardised maximum yield and standardised persistency are almost equally constant (intra-class correlation = approx. + 0·5), whilst, because of the negative physiological correlation between these two, standardised lactation yield is appreciably more constant than either of them (intra-class correlation = approx. + 0·7).

ROWETT RESEARCH INSTITUTE, ABERDEEN.

Clark (M. L.). **Milk Consumption and the Growth of School Children.** *Lancet*, 1921, **216** (1), 1270.

Previous work on feeding milk to school children had been carried out in schools in the larger cities in Scotland. A small test of a similar nature was therefore done with children attending rural schools. From a dietary survey it was found that the latter were consuming slightly larger amounts of milk than the urban children. The results were in accordance with those of the larger test, the feeding of milk resulting in increased rate of growth

in the case of the milk fed children over controls. This would indicate that even rural children do not consume the optimum amount of milk.

HANNAH DAIRY RESEARCH INSTITUTE.

Annual Report for the Year ending 31st March, 1930.

A summary of the first year's work at the Institute. The Report contains a brief history of the establishment of the Institute, and details of the investigations in progress during the year.

ALLEN (L. A.) and BELL (J.). **The Role of Milk Constituents in Bread-making.** *J. Roy. Tech. Coll.*, Glasgow (in the press).

Addition of either whole milk, separated milk or whey to the dough used in breadmaking improved the texture, colour and flavour in the finished loaf. Experiments conducted on the volume of the fermenting dough showed that separated milk had a slight detrimental effect, whey had an appreciable detrimental effect, while whey minus albumin had an appreciable beneficial effect. Boiling milk for 15 minutes under a reflux was found to have a remarkably beneficial effect on the volume during fermentation. The beneficial effect of the preheating of milk prior to spray-drying—so far as its use in baking is concerned—was confirmed.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

THOMAS (S. B.) and HICKSON (P. M.). **Bacteriological Examination of Milk for Local Authorities in Wales.** *Welsh J. Agric.*, Vol. vi, pp. 265–278, 1930.

Seven short courses for Sanitary Inspectors dealing with the hygienic production of milk have been held in the Principality during the past four years.

As a result of these courses as well as Milk Conferences held at Aberystwyth and Bangor, forty-three Borough, Urban and Rural Districts in Wales have organized Clean Milk Campaigns.

In connection with the campaigns nearly 3,500 samples of milk—from approximately 800 farms—have been examined bacteriologically.

Regular bacteriological examination has shown that the Clean Milk Campaigns have resulted in a considerable hygienic improvement.

Practically half the samples have attained Grade A Bacteriological Standards. In the case of some areas which have been carrying on the work for four years or more, 75 per cent. of the producers and retailers attain this standard even during summer months.

Bacteriological examination of water samples from dairy farms and from rural areas has shown that a very large proportion are not fit for dairy purposes.

The bacteriological analyses have been undertaken in connection with a scheme for advisory work among producers, retailers and consumers.

The scheme is being extended to include examination for tubercle organisms in milk samples.

Advisory bacteriological work along these lines is important inasmuch as all samples taken are surprise samples, while samples are taken at regular periods from all producers and retailers in the various districts.

THOMAS (S. B.). **Laboratory Work in connection with Butter Competitions.** *Welsh J. Agric.*, Vol. vi, 279–284, 1930.

The methods of scoring and grading farm butter samples are described, together with the methods of scoring during farm inspection.

The laboratory examination of unsalted butter samples is carried out as follows:—

(*a*) Scoring and grading on arrival.
(*b*) Keeping quality at 60°F.
(*c*) Bacterial count on gelatine at 22°C.
(*d*) Bacterial count on standard agar at 37°C.
(*e*) Mould and yeast count on acidified malt agar.
(*f*) Bottle incubation test.

A comparison of the scoring on arrival and the keeping quality for samples examined during the course of three County Butter Competitions is given.

THOMAS (S. B.). **A Preliminary Report on the Bacteriological Examination of Fresh Cream and Artificial (Reconstituted) Cream.** *Welsh J. Agric.*, Vol. vi, pp. 284–289, 1930.

A bacteriological comparison of fresh cream and artificial (reconstituted) cream has been carried out with the following results:—

(1) The bacterial content of the fresh cream (plate count on standard agar and direct microscopical method) is practically forty times that of the artificial cream.
(2) The average keeping quality of the fresh cream during September to December was 38 hours, as compared with 56 hours for the reconstituted product.
(3) The fresh cream reduced double strength methylene blue in two hours. The artificial cream generally took eight hours or over to reduce the dye.
(4) The types of fermentation in the two products is very characteristic. All samples of the artificial cream gave a very stormy fermentation within twenty-four hours at 37°C. The natural product in all cases gave an even non-gassy curd.
(5) Anaerobic spore formers of the *Clostridium Welchii* group were detected in the artificial cream. These were traced to the milk powder used in manufacture.

THOMAS (S. B.). **The Hygienic Production of Goats' Milk.** *Brit. Goat Soc. Yr. Bk.*, 1930, pp. 15–21.

As a result of the examination of 201 samples of goats' milk for the Welsh Goat Breeders' Association some data has been obtained with regard to the bacterial content, keeping quality and fat content of this type of milk.

It was found that 41 per cent. of the samples attained the Certified Bacteriological samples, and 70 per cent. the Grade A standard. Only 14 per cent. gave a bacterial count over 200,000 per c.c. Coliform organisms contamination was not excessive.

The keeping quality compared quite favourably with cows' milk—the average throughout the year being 2·9 days. A number of samples kept sweet for four days. Only four samples were found with a distinct goaty taint. Of 106 samples examined for fat content, 25 per cent. gave 5 per cent or over, and 64 per cent., 4 per cent. and over.

The details of a County Competition for goats' milk are also given.

THOMAS (S. B.) and MORGAN (G. T.). **Quality in Welsh Farm Butter.** *Farm and Market*, Vol. ii, No. 1, 1930.

Butter competitions held in Brecon and Radnor, Pembroke and Cardigan have led to an investigation into the quality of Welsh farm-produced butter. Samples of unsalted butter are forwarded by competitors to the College for examination. These samples are scored for flavour and aroma, texture,

freedom from moisture, and colour; in addition the samples are scored for keeping quality. These samples were graded as follows:—

"Firsts"	Minimum score of 85.
"Seconds"	,, ,, 80.
"Thirds"	,, ,, 75.
Below Thirds	Under 75.

Over 300 samples were examined with the following results:—

First Grade	26 per cent.
Second Grade	44 ,,
Third Grade	25 ,,
Below Grade	5 ,,

In view of the fact that 60 per cent. of the samples examined have a keeping quality of two weeks or more, the results may be considered good. First Grade samples gave an average keeping quality of approximately one week longer than third grade samples.

THOMAS (S. B.) and MORGAN (G. T.). **Buttermaking; factors in quality.** *Farm and Market*, Vol. ii, No. 1, 1930.

Results of investigational work in connection with the butter competitions have brought out the importance of the following points:—

(1) Supreme cleanliness during the production of milk and cream—paying special attention to the cleanliness of the cream separator.
(2) Management of the cream during ripening.
(3) The importance of a pure water supply.

In addition, an analysis of the common defects in farm produced butter is given.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

THOMAS (B.). **Factors affecting the Composition of Milk.** *Northumberland Milk Rec. Soc. J.*, 1930.

A semi-popular paper written for the information of recorders.

CAMBRIDGE UNIVERSITY.

OXLEY (C. D.). **County Council of the Isle of Ely. Second Clean Milk Competition, 1929–1930.** *Education Committee Report.*

A foreword by the County Medical Officer, Dr. French, and the Report of the Milker's Competition by the Inspecting Judge, Mr. J. H. Anderson, are given.

A report intended for circulation among dairy farmers, setting out conditions of entry, methods of marking and treating of the production and testing of clean milk. An all-round improvement over last year's results is shown: the certificate standard being raised from 55 per cent. to 60 per cent., nine certificates were awarded this year as compared with six last year.

HARPER ADAMS AGRICULTURAL COLLEGE.

PROVAN (A. L.). **Shropshire Clean Milk Competition, 1930.**

There were 18 competitors in this competition, which was held from 10th March to 31st May, 1930. It was found that competitors with previous experience in clean milk production set a much higher standard than those who were novices. This was reflected in the average keeping qualities for the two classes. These were 83 hours for the graded producers and 68 hours for the novices.

Sixty-nine per cent. of the total samples were of Grade A standard. This low figure was due to only 40 per cent. of the samples submitted by novices and cheesemakers being of this standard.

PROVAN (A. L.). **Warwickshire Clean Milk Competition, 1930.**

This competition was held during the period 1st January to 30th June, 1930. The samples from the 41 competitors showed that a very high standard was maintained on many farms. There was a general improvement in the cleanliness of the samples submitted over that of previous years. This was reflected in the average keeping quality, which rose from 73 hours in 1929 to 88 hours in 1930.

Eighty per cent. of the samples received were of Grade A standard, but it was found that during the warm weather in May and June the proportion fell to less than 50 per cent. In this respect the need for efficient cooling during the summer months was stressed. It was also pointed out that there should be no relaxation of care in production while the cows were lying out, and, therefore, appeared cleaner.

MIDLAND AGRICULTURAL COLLEGE.

CRANFIELD (H. T.). **The Value of Milk Analysis to the Dairy Farmer.** *Derbyshire Farmer*, Oct., 1929.

In a short paper the writer pointed out the great variability in composition of milk from herds of cows, and the importance of knowing the extent of variation in quality. Whether milk is sold for liquid consumption or for manufacturing purposes the percentages of Fat and Non-fatty Solids were of vital importance. To the dairy farmer in particular frequent analyses of the milk of individual cows gave him valuable information towards improving the quality of his herd and the milk produced.

CRANFIELD (H. T.). **Why does Milk vary in Composition and how can this Variation be controlled?** *Lancs. Milk Rec. Soc. Yr. Bk.*, 1930.

A résumé of the various factors which may, from time to time, influence the composition of the milk of herds is given, and means whereby the influence of such factors can be controlled are explained. The importance of good management is given considerable emphasis.

CRANFIELD (H. T.). **The Importance of Quality in Milk Production.** *Berks. Farmers' Yr. Bk.*, 1930.

Farmers are urged to give due consideration to the question of quality, i.e., food value, in milk production. The point of view of the consumer is introduced in this paper, and examples given showing the variation in food value which may occur from time to time in the milk produced by a herd. It is suggested that Milk Recording Societies might devote more attention to systematic tests for Fat and Solids not Fat than they have done in the past. Methods of sampling milk for analysis are given.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

BARKWORTH (H.). **Testing for Clean Milk.** *J. Kent F.U.*, Vol. 3, No. 5, p. 193. May, 1928.

The importance of regular bacteriological tests is discussed and emphasised and farmers are urged to take advantage of the facilities for testing offered by the laboratory.

BARKWORTH (H.). **Some factors affecting the Keeping Quality of Raw Milk.** *Milk Ind.*, Vol. x, No. 12, pp. 65, 67, 69, with one plate and one table. June, 1930.

Keeping Quality is defined and the causes of variation in relation to total count are discussed. Coliform organisms may have a marked effect, but fat content is not important. From figures given it is deduced that when Keeping Quality is considered in relation to total count there is a normal range of variation of 12 hours above or below the expected average, which should include two-thirds of the results. It is noted that in the writer's experience samples of afternoon milk average 9 hours less Keeping Quality than samples of morning milk of same total count.

BARKWORTH (H.). **Influence of the fat-content on the Keeping Quality of Milk.** *J. Min. Agric.*, Vol. xxxvii, No. 8, pp. 803–806, with one fig. and one table. Nov., 1930.

Four thousand and two samples are grouped according to fat content, below 3·00 per cent., 3·00–4·00 per cent., and above 4·00 per cent. The average Keeping Quality of samples of similar total count in each group is compared, and it is deduced that fat-content has no significant bearing on Keeping Quality.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

CUNNINGHAM (A.). **The Life-Cycle of** *Bac. saccharobutyricus* **v. Klecki.** *Nature*, Vol. 125, 1930, p. 168.

The results of the investigation are summarised. Seven distinct cell types have been observed—forms similar to the (1) coccoid; (2) short rod; (3) slender rod; (4) large rod; (5) dwarfed growth; (6) fungoid and (7) large cell types of Löhnis and Smith. Representatives of types (1) to (4) have been stabilised and the majority have been identified with previously described "species," the names of which are included.

Formation and germination of endospores, exospores and microcysts have been observed, as well as formation of gonidangia, gonidia and regenerative bodies. Observations have also been made on the formation of and regeneration from the symplasm and on conjunction with formation of regenerative bodies at the points of contact of the cells.

CUNNINGHAM (A.). **The Life-Cycle of** *Bac. saccharobutyricus* **v. Klecki.** *Read at Meeting of the Bacteriology Section of the 5th Intern. Botan. Cong., Cambridge.* Aug. 21st, 1930.

The results of the investigation are summarised (*see* previous abstract). The methods employed are described, and a general account is given of the evidence obtained concerning the relationship of the forms considered to be phases in the life-cycle of the organism. Transformation experiments, in which cocci and large aerobic rods were cultivated from the *saccharobutyricus* type, are described in detail. It is shown that the nature of the cultural findings and the instability of certain of the types obtained, support the view that the latter form part of a life-cycle.

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE.

GLEN (J.) and M'CANDLISH (A. C.). **Factors affecting the Yield and Quality of Milk. II. Variations in Successive Lactations.** *J. Agric. Sci.*, **20**: 45–52, Jan., 1930.

From a study of 4,160 lactation records of 683 cows it has been found that milk and butterfat production rise to about the sixth lactation, but beyond

the fifth lactation the increase may be neglected. The lactation of maximum production may be taken as the fifth which corresponds to 7 years of age. Beyond the fifth lactation the milk and butterfat yields show a downward tendency.

The fat percentage is highest in the first lactation, drops markedly in the second, remains fairly steady for a few lactations, though with a slight downward tendency, and then falls off in the higher lactations.

LEITCH (R. H.). **Cheesemaking. The relative merits of machine and hand drawn milk.** *Glasgow Herald,* 27th Nov., 1929.

The cheesemaking qualities of machine and hand drawn milk—produced simultaneously under the same environmental conditions—were determined by a series of comparative trials. The milk of the Experimental Station herd was used. Both the machine and the hand drawn milks were, from the point of view of bacterial numbers, of excellent quality. The ripe cheeses of the hand drawn milk were awarded by an expert cheese judge an average score of 96 points; those of the machine drawn milk scored 92 points. From this it appears that, while machine drawn milk produced under good conditions will produce a high grade cheese, the best quality of cheese is likely to be associated with clean hand drawn milk.

LEITCH (R. H.). **Buttermaking: Effect of roots and of silage in the ration of producing cows.** *Glasgow Herald,* Jan. 28th, 1930.

The buttermaking quality of the milk of two groups of cows was compared: one group received silage in the basal ration: the other group was fed swedes. The butter made from the milk of the root fed group was uniformly superior in colour, texture and keeping properties to that of the silage-fed group. Details of the experiments are given.

LEITCH (R. H.). **Hygienic Milk Production.** *Trans. Roy. Sanit. Assoc., 56th Ann. Cong.,* Sept., 1930.

A detailed account of the factors which have a direct bearing on the flavour, quality and keeping properties, and safety of market milk. Numerous bacteriological data are presented.

LEITCH (R. H.). **Slow-working cheese.** *Paper read at the Conf. of Dairy Bacteriologists at Reading,* Sept., 1930.

The cause of slow-working in cheesemaking is shown to be due to the abnormally reacting milk of one or more cows in the herd: not to weakness in the starter, or to contamination of the cheese-milk with organisms like *B. subtilis* or *B. coli* or to the presence of blood serum in the milk. The effect of specific activators in slow-working milk as determined experimentally, is described.

LEITCH (R. H.). **Dunlop Cheesemaking.** *The Dairy Trade.* Blackie and Sons, Ltd.

An account of the modern scientific method of manufacturing Dunlop cheese.

LEITCH (R. H.). **Hand v. Machine Milking.** *The Dairy Trade.* Blackie and Sons, Ltd.

An account of the development of the modern milking machine, its utility under good management, its cleaning and care on the farm and its relative efficiency as compared with hand milking under good hygienic conditions. The relative costs of machine and hand drawn milk are given in some detail.

M'Candlish (A. C.). **The Length of Life of the Dairy Cow.** *Scott. J. Agric.*, **13**, 284–7, July, 1930.

The average life of the dairy cow in the producing herd would appear to be about 4 years. When the animals which reach maturity are considered, it is found that those which calved for the first time at an early age have the shortest life but the longest period of usefulness, while those coming into production at higher ages have longer lives but shorter periods in the producing herd. In total lifetime production heifers calving for the first time at about 2½ years of age excel all other groups.

M'Candlish (A. C.) and Cochrane (J.). **A Comparison of Hand and Machine Milking.** *West of Scotland Agric. Coll. Bull.* 121. Sept., 1930. *Scott. J. Agric.*, **13**, 43–50, Jan., 1930.

The literature on milking machines is reviewed and the results of trials including 168 lactations for 51 cows are presented. The trials rank with the largest ever conducted with milking machines.

The two machines used were equal in efficiency and with efficient operation there was no difference in the yields of milk and butterfat obtained by hand and machine milking. The percentages of butterfat in the milk obtained were also quite comparable.

Young cows unaccustomed to hand milking take readily to the machine; old cows may sometimes do so less readily. The method of milking does not affect the length of the lactation. There are no great differences in rate of milking between the various methods. The most important factors influencing the rate of milking are the yield of milk and the individuality of the cow.

The efficiency of the operator is of greater importance than the type of machine, and the individuality of the cow must be studied. Recommendations regarding methods of operation are given.

The size of the herd, rather than the wages paid for labour, is the most important factor in determining the cost of machine milking in Scotland. On the other hand, the rate of wages, rather than the size of the herd, is the main factor in determining the cost per cow of hand milking. Where wages are high the cost of milking per cow will be less by machine than by hand in a 40 cow herd, but where wages are low the herd must be over 60 before the installation of a milking machine is justified economically.

Of the milk recorded herds in Scotland 13 per cent. are machine milked, while 12 per cent. have reverted from machine to hand milking. There is great variation in the extent to which the milking machine is used in different districts of Scotland. In the Clyde Valley only 2 per cent. of milk recorded herds are machine milked while in the south-west 28 per cent. are machine milked.

(P) ANIMAL PATHOLOGY.

DEPARTMENT OF ANIMAL PATHOLOGY, CAMBRIDGE.

Bosworth (T. J.). **Blackleg (Vaccination).** 11*th Internat. Vet. Cong., Lond.*, 1930.

At the outset the question of the etiology of blackleg is discussed in view of the controversy which has arisen on the subject. Blackleg is considered to be a specific disease caused by *B. chauvoei*, and is to be distinguished from infection due to other anaerobes. The various methods of protective inoculation of animals against the disease are reviewed with particular attention to their relative value as immunising agents, and their safety for use under field conditions. Experience has shown that very satisfactory results may be obtained with either artificial agressin or formolised vaccine. The latter product is recommended for general use.

Bosworth (T. J.). **Some Common Ailments of Ewes and Lambs.** *Vet. Rec.*, 1929, ix, No. 49.

A review of the more important diseases associated with pregnancy and early life. The chief points under discussion are the incidence of these conditions, their etiology, and the measures available for their control.

Bosworth (T. J.). **Actinomycosis Common to Man and Animals.** *Proc. R. Soc. Med.*, 1930, p. 870.

A summary of the incidence, characters, and differential diagnosis of the various infections of domesticated animals to which the term "actinomycosis" is applied. The use of the term in this general sense is undesirable and frequently misleading, and it is suggested that the several conditions should be designated according to the types of the invading organisms concerned.

Buxton (J. B.): **A note on *Vibrio Foetus Ovis* in the Ram.** In the press.

Evidence is adduced of the spread of vibrionic abortion in ewes by a ram which harboured the causal organism in its blood.

Buxton (J. B.). **Experimental Studies of the Pathogenicity of the Preisz-Nocard bacillus in Sheep.** In the press.

The pathogenicity of the Preisz-Nocard bacillus has been studied in several breeds of British sheep and in lambs as well as adult animals. It would appear that while lambs show more resistance to infection than do adults, British sheep in general are highly susceptible to infection by the usual experimental methods, and that the disease may be spread with facility under natural conditions, from which facts it is deduced that, despite expressions of opinion to the contrary, the disease occurs rarely, if at all, in this country.

Cornell (R. L.) and Griffith (A. S.). **Types of Tubercle Bacilli in Swine Tuberculosis.** *J. Comp. Path. and Thera.*, Vol. xliii, pp. 56–62, Mar., 1930.

Submaxillary glands from 103 pig carcases condemned for tuberculosis were examined with a view to identifying the type of organism responsible or the lesions.

Cultures were obtained in 95 cases—in 93 directly from the material and in 2 instances through the guinea pig. Of the 95 strains, 63 were dysgonic and identical in characters with tubercle bacilli of bovine origin, 31 exhibited the characteristic growth of the avian type, while the remaining one produced the typical growth of an eugonic human type of bacillus.

FRASER (A. C.). **A Study of the Blood of Cattle and Sheep in Health and Disease.** In the press.

Blood of cattle and sheep has been examined at various ages from within a few hours of birth to the adult state. The appearances of the elements in supra-vitally stained and fixed specimens are described and discussed and the actual numbers in which they presented themselves as well as the proportions in which they appeared are recorded.

GLOVER (R. E.). **Observations on the Double Intradermal Tuberculin Test.** *Vet. Rec.*, 1930, x, No. 37.

A short article giving a brief description of the difficulties which have been encountered in the application and interpretation of the test with suggestions of methods by which they may be overcome.

GLOVER (R. E.). **Tuberculin Testing of Graded Herds of Cows.** *Brit. J. Tuberc.*, 1930, xxiv, 2, p. 75.

A general description of the methods of tuberculin testing with special reference to the subcutaneous and intradermal tests.

GLOVER (R. E.). **Variola in Domestic Animals. Contagious Pustular Dermatitis of Sheep and Goats.** *Paper presented to* 11th *Intern. Vet. Cong., Lond.*, 1930.

In this paper, the relationship of this disease to members of the group of "pox" diseases is discussed. A brief description of the lesions under natural and artificial conditions is given, and experiments on the transmission of the disease from the sheep to the goat and *vice versa*, on cross-immunity between different strains, and on the nature of the virus, are cited. Experiments are also detailed which indicate that the virus, under certain conditions, is capable of producing a subacute form of mastitis in the lactating ewe.

GLOYNE (S. R.), GLOVER (R. E.) and GRIFFITH (A. S.). **Experiments to Determine whether there is a Filterable Form of the Tubercle Bacillus.** *J. Path. Bact.*, 1929, xxxii, pp. 775–786.

Emulsions of different strains of tubercle bacilli (human, bovine and avian) were obtained from natural and experimental lesions, from human sputum and from cultures.

After suitable preparation these emulsions were filtered through Berkefeld N or Chamberland L_2 candles, and the filtrates were inoculated into susceptible animals. These were killed after periods varying from 90 to 311 days, and careful post mortem examinations were made with re-inoculations into fresh animals where suspicious lesions were detected. None of the animals showed the slightest evidence of tuberculosis, and no acid-fast bacilli or granules were found in preparations from the various organs and glands. Hence, the experiments failed to demonstrate the existence of a filterable form of the tubercle bacillus.

INNES (J. R. M.) and HARRIS (L. J.). **The Histopathology of Hypervitaminosis D.** *Proc. Biochem. Soc. Chem. and Ind.*, Vol. 48, No. 41, Oct. 9th, 1929.

Lesions produced in rats and rabbits receiving overdoses of irradiated ergosterol are highly characteristic. The most prominent feature is the

formation of typical calcium deposits in various organs. The type of calcification differs from that seen in other pathological conditions and is not post-necrotic. The abnormality in the arterial wall is distinct from arterio sclerosis: the primary lesion is in the media, fatty changes are absent, and there is no tissue reaction or cellular infiltration. It is incorrect to designate the kidney lesions as interstitial nephritis. There occurs also atrophy of lymphoid tissue (spleen, thymus, Peyer's Patches). In contrast, rats who had been deprived of vitamin D were found to develop hypertrophied spleens. In several other directions excess of vitamin D produced results opposite to those of deficiency.

INNES (J. R. M.). **Arterio-Sclerotic Kidney (Primary Contracted Type) and Secondary Contracted Kidney in the Dog.** *Vet. Rec.*, 1930, x, No. 31.

The histological features of a case of arterio-sclerotic kidney in the dog were described and compared to a case of secondary contracted kidney and also compared with differential pathology of similar conditions in man. This organic disease of the kidney in the lower animals has hitherto been regarded as non-existent.

Histologically, the disease process was distinctly shown to be the end result of a widespread and irregular arterio-sclerosis of the small arteries in the kidney causing focal degeneration and destruction of the parenchyma with a resultant scar formation. It was shown that the glomerula and tubular changes in the cortex were distinct and different in areas where the blood supply had abruptly ceased from those areas where the arterio-sclerosis was not so well marked. The glomerular changes were also compared to those observed in the secondary contracted type, where arterio-sclerotic changes were absent.

It was emphasized that this secondary contracted type of kidney lesion should be classified as such and not compared to the primary contracted kidney in man, as has been done by other authors when such a feature as the arterio-sclerosis was absent.

WOOD (W. A.). **A note on** *Rugopharynx australis* **(Monnig, 1926).** *Ann. &. Mag. Nat. Hist. Ser.* 10, Vol. iv, p. 552, Dec., 1929.

This short note furnishes a further description of *R. australis*, and suggests its re-classification.

RESEARCH INSTITUTE IN ANIMAL PATHOLOGY, ROYAL VETERINARY COLLEGE.

MINETT (F. C.). **Clinical forms and bacteriology of bovine mastitis.** *Proc. R. Soc. Med.*, 1930. Vol. 23, 22, 1930.

An account of the various clinical forms of bovine mastitis met with in practice and of the bacteria with which they are associated.

MINETT (F. C.). **Bovine Mastitis.** *Rep. to XI Internat. Veter. Cong.*, pp. 15, 1930, John Bale, Sons and Daniellson, Ltd., Lond.

The report is a general one summarising such of the existing knowledge of the subject. The particular aspects dealt with are as follows: (1) distribution and economic importance; (2) forms of mastitis; (3) the dissemination of mastitis in nature; (4) the diagnosis of chronic forms of mastitis; (5) the control of mastitis.

MINETT (F. C.). STABLEFORTH (A. W.) and EDWARDS (S. J.). **Studies on Bovine Mastitis. I. The Bacteriology of Mastitis.** *J. Comp. Path. and Thera.*, Vol. 42, 213, 1929.

A report of a preliminary nature dealing with the bacteriological findings in samples of udder secretion from 113 clinical cases of mastitis. Eighty-

two of these cases were associated with streptococci, six with staphylococci, twenty-one with *B. pyogenes*, three with coliform bacteria, and one with *B. necrosis*. The principal characters of these bacteria are set out with special reference to the streptococci.

MINETT (F. C.), STABLEFORTH (A. W.) and EDWARDS (S. J.). **Studies on Bovine Mastitis. III. The diagnosis of streptococcus mastitis.** *J. Comp. Path. and Thera.*, Vol. 43, 163, 1930.

Four of the principal procedures put forward for the diagnosis of chronic mastitis are compared, using in each case the same samples of milk. The methods examined were:—

Cultural and microscopic methods.
Observation of the amount and characters of the sediment obtained by centrifuging a fixed volume of milk, and,
observation of the reaction of the milk by means of brom cresol purple.

At a single examination cultural methods on a suitable medium are the most reliable and microscopic examination the least reliable. The sediment and reaction tests are valuable supplementary aids.

STABLEFORTH (A. W.). **Studies on Bovine Mastitis. II. Diagnosis by means of the reaction of the milk to brom cresol purple.** *J. Comp. Path. and Thera.*, Vol. 43, 24, 1930.

An account of reaction methods for the diagnosis of mastitis, particularly that in which brom cresol purple is used. The cause of the change in reaction and the influence of certain factors, such as the fat content of milk, the duration of storage, etc., is discussed.

STABLEFORTH (A. W.). **Tuberculosis in cattle.** *J. Kent F.U.* Vol. 27, 1, 1930.

An address delivered before a meeting of farmers.

MINISTRY OF AGRICULTURE AND FISHERIES, VETERINARY LABORATORY.

ANDREWS (W. H.). **Foot and Mouth Disease.** *Proc.* 11th *Internat. Vet. Cong., Lond,* 1930.

Discussing the plurality of viruses, the author points out that, of the three recognised types, "A" type has been recorded only once in Great Britain, and "C" type has not yet been encountered. More than 90 per cent. of British outbreaks appear to be due to viruses of the "C" type. In 1929 two viruses occurred in England that were immunologically distinct from the three recognised types and from each other.

At Pirbright "humoral" immunity has been shown to persist in cattle as long as 32 months, and an end-point has not yet been reached. "Tissue" immunity appears to persist for more than 6½ months and less than 15 months.

DOYLE (T. M.). **Immunisation of Fowls against Fowl Pox by Means of Pigeon Pox Virus.** *J. Comp. Path. and Thera.*, xliii, 1930, pp. 40–55.

This article contains details of experimental work done in connection with the immunisation of fowls with pigeon pox virus. The conclusions are as follows:—

1. Pigeon pox vaccine confers on fowls a solid immunity against natural infection with fowl pox.
2. Immunity is fully established about the 14th day after inoculation.

3. The vaccine confers considerable, but not complete, protection against severe artificial infection with fowl-pox virus. It prevents generalisation of infection, and the lesions usually clear up quickly. This is in contrast with the generalisation of infection, accompanied by loss of condition and heavy mortality, which occurs in non-vaccinated fowls.

4. The vaccine does not give rise to any constitutional disturbance or loss of condition, nor, as far as has been ascertained, does it interfere with egg production.

5. Susceptible fowls do not contract infection when kept in contact with fowls exhibiting active pigeon pox lesions on the comb, mouth or skin.

6. The virulence of pigeon pox virus for fowls can be exalted by serial passage through fowls.

7. In pigeon pox virus we possess a valuable agent for the protection of fowls against natural infection with fowl pox. When employed in conjunction with hygienic measures, it should bring about a marked and rapid reduction in the incidence of the disease.

Doyle (T. M.). **Fowl Pox.** 11th *Internat. Vet. Cong., Lond.*, 1930.

The paper gives a comprehensive survey of the disease, and deals with the filterability of the virus, the relationship between the comb and mouth lesions of fowl pox, and also the relationship between fowl pox and vaccine.

The question of "carriers" is discussed, and it is pointed out that whereas pigeons affected with pigeon pox may harbour the virus in the system for long periods, neither field nor laboratory experiments have produced any evidence of a similar occurrence in the case of fowl pox.

The various methods of immunisation are considered; dead virus has proved valueless, and attenuated or modified virus, which has in the past been occasionally employed for controlling virulent outbreaks, is too unreliable in its action for general application.

Pigeon pox virus is now generally employed for immunisation purposes.

Doyle (T. M.). **Fowl Pox.** 4th *World's Poult. Cong., Lond.*, 1930.

This paper contains a brief survey of recent work on the disease.

Hole (N.) and Purchase (H. S.). **Some Uncommon Pathological Conditions met with in Poultry.** *Vet. Rec.*, 5th April, 1930.

An account of some unusual conditions met with in the course of routine diagnosis work.

Purchase (H. S.). **Active Immunization of Fowls against Fowl Plague.** *J. Comp. Path. and Thera.*, xliii, June, 1930, pp. 151–157.

A study of Todd's method of immunization with a phenol-glycerine virus. The method was found to give irregular results, and it failed to immunize birds in a very considerable proportion of cases. The author's experiments led him to ascribe the superiority of liver tissue, for the purpose of vaccine preparation, to the contained bile.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

Williams (R. Stenhouse). **Human Mortality from Bovine Tuberculosis in England and Wales.** *J. B. D. F. A.*, **42**, 1930.

In this paper the author has collected estimates made by various authors of the proportion of human deaths in England and Wales due to bovine tuberculosis. He also draws attention to the limitations of accuracy and the difficulties which have to be contended with in making such estimates.

ANIMAL DISEASES RESEARCH ASSOCIATION OF SCOTLAND.

Pool (W. A.). **Lamb Dysentery.** *Trans. Highl. Agric. Soc. Scot.*, 1929, Vol. xli, p. 47.

Evidence is submitted that a type of *B. welchii* is the cause of Lamb Dysentery. Ingestion appears to represent the mode of infection, and the evidence suggests that the lambs acquire infection during the first few hours of post-natal life.

Serum prepared from different strains of *B. welchii* obtained from affected lambs proved of great value as a protective agent.

Greig (J. R.). **Calcium Gluconate as a Specific in Milk Fever.** *Vet. Rec.*, 1930, Vol. x, p. 115.

The injection of Calcium gluconate, a neutral organic salt prepared from Calcium and Gluconic acid, is discussed as a curative in the treatment of Milk Fever. Upon the results of 32 cases experimentally treated by the intravenous and subcutaneous injection of Calcium gluconate, the author claims that his method may be regarded as a specific treatment which has several advantages over the classic method of mammary insufflation.

Greig (J. R.). **Studies in the Prevention of Milk Fever.** *Vet. Rec.*, 1930, Vol. x, p. 301.

A survey of calcium metabolism is given. That Calcium gluconate is a specific curative treatment is further supported by a study of 53 cases of Milk Fever in which the treatment was employed.

Methods for the prevention of the disease by injection of Calcium gluconate, and by the administration of massive doses of Vitamin D are discussed.

Greig (J. R.). **The Nature of Milk Fever.** *Rep. to the* 11th *Internat. Vet. Cong.*, Lond., Aug., 1930.

This paper summarizes the various theories that have been put forward from time to time upon the nature of Milk Fever. The parathyroid deficiency (hypocalcaemia) theory of the nature of Milk Fever, which was first enunciated by Dryerre and Greig in 1925, is discussed. Their subsequent experimental work is described, and it is concluded that the essential cause of Milk Fever is an acute blood-calcium deficiency, and that the specific curative action of mammary inflation consists in raising the blood-calcium values.

Lambing Sickness is shown to be due to an acute hypocalcaemia.

ROWETT RESEARCH INSTITUTE, ABERDEEN.

McGowan (J. P.). **Some Points in Regard to the Genesis of Mesoblastic Tumours.** *Edin. Med. J.*, 1929, **36**, 645.

Where coal-tar was injected intraperitoneally into fowls, granulation tissue or a granuloma was first formed. Thereafter scar tissue was formed in some places, in others definite fibromota appeared. A reason for this differential development is suggested.

This emphasised that fibroid mesoblastic tumours appear to be of the nature of perverted repair processes.

The tumours here produced are compared with like tumours. The general aetiology is discussed and it is reaffirmed that such mesoblastic tumours are tumours within a system, the reticulo-endothelial system. Metastases in such cases are not regarded as true metastases.

The part played by the "stimulin" is rediscussed and a new designation, "Cledone," is suggested for this principle.

McGowan (J. P.). **The Alkali-Reserve of the Blood in relation to the Van den Bergh Bilirubin Test.** *Edin. Med. J.*, 1930, **37**, 28.

Diminution of the alkali-reserve of the blood is readily produced in anaemia. This, together with the acidity of Van den Bergh's reagent, seems to be the basis of the "indirect" reaction and goes to show that probably "direct" and "indirect" bilirubin are identical chemically. The liver cell probably plays no part in forming bilirubin. Gastric Achylia in anaemia in all probability is related to the "chloride stuff" of the blood. Inaccuracies in estimating bilirubin by the ordinary method are referred to.

McGowan (J. P.). **Subacute Combined Degeneration of the Cord in Primary Anaemia of the Fowl.** *Brit. Med. J*, 1930, No. 3631, 204.

The essential and primary factor in the production of pernicious anaemia is the involvement of the bone marrow in an irritative process, which causes it to revert to embryonic cell formation.

The resulting anoxaemia causes, secondarily, the complications which are to be found in the central nervous system, the stomach and the liver (later stages).

There is no evidence for the existence of a "pernicious anaemia diathesis" either in relation to the disease as a whole or to the organ complications.

ANIMAL BREEDING RESEARCH DEPARTMENT, EDINBURGH UNIVERSITY.

Gilroy (E.). **Comparison of the Effects of Arginine and Thyroxine upon Tumour Growth-rate in the Mouse.** *Biochem. J.*, 1930.

Injections of thyroxine retarded the rate of tumour growth. Substitution of arginine for thyroxine caused a rapid renewal of growth but if Arginine had been given previously the substitution of thyroxine did not cause a permanent deflection of the curve. An antogonism in the effect of these two substances in respect of tumour growth was indicated.

HANNAH DAIRY RESEARCH INSTITUTE, AYR.

Jordan (L.). **Can Tuberculosis be eliminated?** *Farmer and Stock-breeder*, Apr. 7th., 1930.

A short popular discussion of the problem of the eradication of bovine tuberculosis in Great Britain.

ANIMAL DISEASES DIVISION, MINISTRY OF AGRICULTURE, NORTHERN IRELAND.

Rice (J. P.). **Fowl typhoid and bacillary white diarrhoea.** *Proc.* 11th *Internat. Vet. Cong.*, 1930.

A review of new and controversial aspects of these diseases. The main part of the report is devoted to the agglutination test, which is preferred to the intradermal test. The collection of samples, the composition of the antigen and the titre to be accepted as positive are discussed.

Attention is drawn to the close relationship existing between bacillary white diarrhoea and fowl typhoid, and it is suggested that they are merely different forms of the same disease.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

THOMAS (S. B.). **Mastitis in Dairy Cattle.** *J. Agric. Soc., Univ. Coll. Wales*, Vol. xix, pp. 36–43, 1930.

A popular monograph on the prevalence and description of bovine mastitis. The organisms causing the disease are described.

Some results of the use of the bromcresol test and microscopic examination of milk for streptococcic mastitis are given.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

HENDERSON (D. W.). **A Study of Certain Anaerobes Isolated from Sheep and Their Significance in Certain Sheep Diseases.**

This is primarily a study of the etiological factors concerned in "grass-ill" and "lamb dysentery."

"*Grass-ill.*"—The work recorded in a previous publication (Journ. Comp. Path. and Thera., Vol. xlii, Dec., 1929) is extended and confirmed. *Vibrion septique* (Pasteur) plays an important rôle in the causation of this disease. *Bacillus welchii* types have no etiological significance.

Lamb dysentery.—From typical living cases of this disease an organism has been isolated in pure culture indistinguishable from Dalling's "L.D. bacillus." Examination of cases dead or dying confuse results. Limited material from cases other than lamb dysentry or grass-ill failed to reveal the presence of the "L.D. Bacillus." This organism is sharply differentiated from typical *Bacillus welchii* in cultural and immunological characteristics. A raffinose and sorbite fermentation test is recorded as a further means of distinguishing these organisms.

STEWART (W. LYLE) and HENDERSON (D. W.). **Anaerobic Infections in Lambs.** *J. Comp. Path. and Thera.*, Vol. xlii, p. 241–258, Dec., 1929.

The etiology of the disease known as "grass-ill" in lambs is investigated. It is shown with the limited number of cases examined that the causal organism responsible for the condition is indistinguishable from Vibrion septique (Pasteur).

Evidence is produced showing that "grass-ill" is confused with "lamb dysentery," "louping-ill" and "wool-ball."

From cases of lamb dysentery Dalling's "L.D. Bacillus" has been isolated and his differentiation of this organism and typical *Bacillus welchii* confirmed. A possible new factor in their differentiation is also recorded.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

MONTGOMERIE (R. F.). **Recent Research on the Dosage of Sheep Infested with Liver Flukes.** *Scott. J. Agric.*, Vol. xii, pp. 399–405, Oct., 1929.

A review of recent work on the efficiency of carbon tetrachloride in the treatment of liver rot, illustrating how the assailable "age" of the fluke varies with the dose of the drug administered. The practical application of this work is discussed.

HARPER ADAMS AGRICULTURAL COLLEGE, NEWPORT.

KERR (W. R.). **Coccidiosis.** *Vet. Rec.*, Vol. x, No. 38, Sept., 1930. *Vet. J.*, Vol. 86, No. 10, pp. 420–421, Oct., 1930.

The treatment and control of "Avian Coccidiosis" occupied the greatest part of the time possible for investigations. The main points are as follows:—

That chemical disinfection is of no value as shown by laboratory and inoculation experiments. Some oöcyst have powers of resistance to climatic conditions, putrefaction, etc.

Sanitary measures have a controlling action limited to its effectiveness.

The use of iodine in milk added to the drinking water in combination with sanitary measures was advised following experimental results.

Adult Coccidiosis was shown to be prevalent amongst flocks and data given in treatment and control of this condition.

KERR (W. R.). **Selective media for the isolation of** *B. pullorum* and *B. Sanguimarium.* *J. Com. Path. and Thera.*, Vol. xliii, Part I., 1930.

A report of the previous work of the adviser. The use of a medium containing brilliant green, in the cultural examinations of faeces from suspected chicks and results obtained. The isolation of *B. pullorum* by this means from the faeces of adult carriers affected with a chronic diarrhoea indicated a possible source of infection to susceptible birds.

LIVERPOOL UNIVERSITY.

DAVIES (G. O.). **Abdominal Cysts in Hens.** *Vet. Rec.*, Vol. x, No. 14, 1930, p. 309.

A record of a case encountered in the course of routine examination.

DAVIES (G. O.). *Corynebacterium Pyogenes* **as the cause of Polypoid Lesions in the Reticulum of an ox.** *J. Comp. Path. and Thera.*, Vol. xliii, Pt. 2, 1930.

The author records one such case. The lesion was granulomatous in nature, and colonies showing some similarity to those of actinomycosis were present. These, however, were distinguishable microscopically. References are given where writers consider *Bacillus pyogenes* as the causative organism of clinical actinomycosis.

GAIGER (S. H.) and DAVIES (G. O.). **"Keel Disease" in Ducklings.** *J. Comp. Path. and Thera.*, Vol. xliii, Pt. 2.

An outbreak of "Keel Disease" in ducklings is described in Britain. It appears to be the first recorded outbreak in this country.

A bacillus belonging to the *Salmonella* group was apparently the causal organism. This bacillus was found to be culturally, pathogenically and serologically identical with, or very closely related to, *Salmonella anatum*, Rettger and Scoville, non-aertrycke type.

The writers put forward the view that the pathogenic powers of the *S. anatum* are of a low order, that possibly the organism may be found to be a normal inhabitant of the intestines of ducklings, and, further, that the capacity to become pathogenic depends upon the operation of some predisposing factor, as in this case feeding with fermented foods.

GAIGER (S. H.). **Grass Disease in Horses.** *J. Yorks. Agric. Soc.*, 1930, pp. 29–38.

This article gives a résumé of knowledge upon this subject, dealing with distribution, history, animals affected, symptoms, and post mortem lesions. A discussion is given on causation, treatment and prevention.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

McEwen (A. D.). *B. paludis*: **a New Species of Pathogenic Anaerobic Bacterium.** *J. Comp. Path. and Thera.*, **43** (1): 1–21, 1930.

B. paludis is a new species of pathogenic anaerobic sporulating bacterium which has been isolated from sheep rapidly overtaken by death whilst grazing on marshy pasture.

B. paludis in morphology and cultural characters closely resembles *B. welchii*, but is definitely distinguishable from that bacterium by the specificity of its toxin. *B. paludis* toxin is readily obtained in filtrates from young bacterial cultures. Intravenous inoculation of toxin into rabbits is characterised by the death of the animals without a latent period. The subcutaneous inoculation of toxin into laboratory animals produces oedema and necrosis and death after a period of some hours. *B. paludis* antiserum prepared for rabbits completely neutralised the action of the toxin. *B. welchii* antiserum had no effect upon *B. paludis* toxin and *vice versa*.

McEwen (A. D.). *B. welchii* **as the cause of Black-quarter in sheep.** *Vet. Rec.*, **10**, 71.

The identification of *B. welchii* as the cause of black-quarter in sheep is recorded.

McEwen (A. D.). *Brucella Abortus* **Infection in Cattle.** A system of Bacteriology in Relation to Medicine, **5**, 427.

An account is given of the pathology of the disease, the means by which the infection is spread, the varying susceptibility of animals to the infection, the epizootiology of the disease, the means of diagnosis, methods of vaccination and eradication and control of contagious abortion in cattle. *Brucella abortus* infection of swine is briefly considered.

Roberts (R. S.). **An atypical case of Johnes Disease on the College Farm.** *J. S. E. Agric. Coll.*, **27**, 214.

An animal showing symptoms of debility reacted to the Johnine test. The animal was slaughtered and examined. The caecum and colon were not diseased but the ileum was affected. This animal had never shown symptoms of diarrhoea, which may be attributed to the peculiar localisation of the lesions.

(Q) ECONOMICS.

AGRICULTURAL ECONOMICS RESEARCH INSTITUTE, OXFORD.

Occasional Notes. (Quarterly Periodical.)

Vol. I. No. 8. Oct., 1929.

Britain's Food Supplies, IV. Eggs and Poultry. Sugar Beet Tops. Losses in Storing and Spreading Farmyard Manure. Crop Changes in Northamptonshire.

,, No. 9. Jan., 1930.

Britain's Food Supplies, V. Cereals. The Effect of Price on the Subsequent Marketing of Sheep on the Metropolitan Market, London, 1874–1900. Consumers' Co-operative Societies as Milk Distributors. Demand for Work Horses in Towns. Livestock Changes in Northamptonshire.

,, No. 10. Apr., 1930.

Britain's Food Supplies, VI. Potatoes. The Price of Porkers in England and Wales. The Migration of Farmers into Oxfordshire. Steam Tackle Costs, 1925–28. Horse Labour Costs, 1927–28, Oxford Province. Tractor Costs, 1927–28, Oxford Province.

,, No. 11, July, 1930.

Seasonal Variation in the Price of Milking Cows in England and Wales, 1907–13 and 1923–28. Wheat Costs and Returns, Oxford and Northants Province, 1925–28. Changes in Farm Tenancy. The Enlargement and Consolidation of Holdings. The Position of the Canadian Wheat Pool. The Effect of Early Laying on the Returns from Pullets.

Bridges (A.) and Lee (J. R.). **Sugar Beet Costs and Returns for the Year** 1928–29. pp. 50.

This report on the costs and returns from growing sugar beet, the fifth of a series issued by the Institute, is based on returns obtained from 437 growers in all the chief beet-growing counties of England and Wales, and covering an area of 4,518 acres of the crop. In addition to chapters dealing with costs and returns, consideration is also given to the value of the by-products of the crop, and there is a further chapter on variations in cultivation and manuring.

Dixey (R. N.) and Bridges (A.). **The Farmer's Business. A Study based on conditions in Part of South Oxfordshire in 1923.** Pp. 47. Clarendon Press.

The financial results of one year's operations on 148 farms are analysed in this report, with the object of enabling the farmers to compare their individual businesses with the standard organization of the district. Data relating to the more successful and to the less successful farms are presented, and certain general conclusions are drawn from the more obvious trends of the evidence.

Orwin (C. S.). **The Reclamation of Exmoor Forest.** Pp. 172, Oxford University Press.

This book records the inclosure and reclamation for farming of this well-known hill district of Somerset. Very little has been recorded of the steps

by which much of the waste lands of England were brought under cultivation during the agricultural revolution from the end of the eighteenth century onwards, and though climatic conditions on Exmoor introduced exceptional difficulties much of the work done is typical of the activities of the land improvers of the time.

ORWIN (C. S.). **The Future of Farming.** Pp. 156. Clarendon Press.

The depression in the arable farming industry is considered in this book, both as to its causes and remedies. Briefly, it is suggested that the old theory upon which mixed farming is conducted requires re-examination in the light of modern knowledge on the maintenance of soil fertility, and that the harnessing of machinery to the farmer's operations on a much larger scale than at present is necessary if wages and profits are to be maintained in the face of world competition.

ORWIN (C. S.). **Progress in English Farming Systems. III. A Specialist in Arable Farming.** Pp. 24. Clarendon Press.

This is a record of a remarkable achievement by a Berkshire farmer who has made a great fortune out of corn-growing all through the years of the agricultural depression at the end of last century. His methods have provided a text for some of the discussions in the volume above.

PREWETT (F. J.). **A Survey of Milk Marketing in Derbyshire.** June, 1928. Pp. 70. Clarendon Press.

This survey presents statistically the milk marketing and disposal conditions of Derbyshire. It is shown that the County of Derby, with a population of some 700,000, chiefly industrial, and with such large liquid milk markets as Manchester, Sheffield, and, to a lesser degree, Nottingham, adjacent to the milk producers of the county, yet exports one-third of its total liquid production to London and consumes a further very considerable proportion of its milk output in manufacture. Individual milk producers are in keen competition with one another for a liquid market, and prices, therefore, show an extreme variation. An analysis of the distributive machinery of the liquid milk supply of the town of Derby is included.

PREWETT (F. J.) and BLIGH (S. M.). **Progress in English Farming Systems. II. The Improvement of Upland Grazings.** Pp. 36. Clarendon Press.

In this report the thirty years' experience of Mr. Bligh, of Cilmery Park, Builth Wells, in reclaiming and in improving rough grazings on an economic basis is described. It has been Mr. Bligh's practice to take over, on the retirement or death of tenants, those parts of the farm which the tenant had not attempted to cultivate intensively. Such land would fall into the classification of "Rough Grazings," with a rental value of 5s. to 7s. 6d. per acre, and, on an economic basis, Mr. Bligh has brought this land up to a rental value of 25s. to 40s. per acre by establishing permanent seeds mixtures.

SKILBECK (D.) and MESSER (M.). **The Incidence of Farming Prosperity and Depression. A Survey of Conditions in England To-Day.** Pp. 37. Clarendon Press.

An enquiry conducted by means of a questionnaire sent to members of The Land Agents' Society and of the Surveyors' Institution, asking for particulars of Notices to Quit and requests for Rent Reductions occurring during the previous year on the estates under their management, the replies being tabulated under various headings, size of farm, soils, type of farming, etc., together with a description of local conditions based on the opinions offered by the questionnaire.

MINISTRY OF AGRICULTURE AND FISHERIES.

Markets and Fairs in England and Wales. Part V.—Welsh Markets; Part VI.—London Markets; Part VII.—Final Review. *Min. Agric. Econ. Ser. No.* 26. Pub. H.M.S.O., price 6d. net.

Part V of this volume deals with the 242 markets and 570 fairs of Wales, on lines similar to those followed in the surveys of the Midland, Northern and Eastern and Southern markets. (*Econ. Ser. Nos.* 14, 19 *and* 23.). Section I of this Part surveys the Welsh markets and fairs as a whole, Section II reviews the markets of each county in relation to local agricultural conditions, and in Section III certain Welsh markets have been selected for detailed description. The appendices form a complete guide to the markets and fairs of the Principality.

Part VI summarises the London markets as a whole and describes all the principal London wholesale markets and exchanges.

Part VII discusses some of the major problems connected with the administration of markets which the survey, as a whole, has brought to light.

There is now available—in this volume, those mentioned above and in *Econ. Ser. No.* 13 (General Review)—a complete record of the markets and fairs of this country, the information given providing a basis for judging their adequacy and efficiency in relation to their general environment.

The Marketing of Dairy Produce in England and Wales. Part I.—Cheese. *Min. Agric. Econ. Ser. No.* 22. Pub. H.M.S.O., price 6d.

Like the other Reports on commodity marketing in the Economic Series, this Report is based on a comprehensive survey of marketing methods in this country and contains suggestions for improvement in, and comparisons with, marketing methods in other countries. A preliminary section gives a general survey of cheese production, describing the numerous types and varieties of cheese on the market, and the localisation and systems of manufacture; information is also given as to supplies, demand and prices. The second section deals with the question of preparation of cheese for market and outlines a scheme for the grading and marking with the National Mark of home-produced cheese. The processes of assembly of cheese from the producer, and its distribution to the consumer, are described in the two succeeding sections. Examples are cited of organisation of cheese producers abroad for marketing purposes, and suggestions are made as to the possibilities of similar developments in this country. Methods of transportation and storage are described in the fifth and sixth sections of the Report. Then follows a brief outline of the utilisation of the by-product of cheese making —whey. The concluding section summarises the possibilities of improvements in the methods of marketing cheese and the bearing on cheese marketing of possible changes in the organisation of the dairy industry. The Report is fully illustrated.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

Ashby (A. W.). **Some Human and Social Factors in Agricultural Depression.** *Proc. of Conferences, Agric. Econ. Soc.*, 1929.

Topics include: human attitudes to economic organisation; standards of living; effects of migration on age and quality of agricultural population; comparison of age-level of workers in agriculture and some other industries; some evidence of mental conditions in rural districts. The economist is dealing with human materials: it is necessary for him to understand physical and mental conditions and qualities, and essential mental attitudes towards the agricultural industry and its organisation.

ASHBY (A. W.). **Some Impression of Agricultural Economics in U.S.A.** *Proc. of Conferences, Agric. Econ. Soc.*, 1929.

The specialisation in work and the great increase in staffs for study of agricultural economics is noted. Collection of raw materials of study, and use of statistical methods, is very widespread; but there is need of synthetic work. Many results which are of value get back to farmers who use them, but some do not. Possibly the more elaborate work fails to obtain due appreciation by farmers. The work on prices and on index numbers has been of special value for general purposes. American farmers tend to turn towards market and political arrangements for improvement of financial results. Growth of study of rural sociology and rising appreciation of this applied science is noted.

ASHBY (A. W.). **Egg and Poultry Prices in Great Britain.** *Conf. Papers, Sec. D. Econ. (inc. Marketing). 4th World's Poult. Cong.*

Changes in prices of eggs and poultry 1914–1929 by index numbers, and a comparison with changes in other prices and the "purchasing power" of eggs are shown. Changes in imports and their influence on prices of home produce are discussed with Tables, and with particular reference to seasonal production and prices. The improvement in methods of production and marketing in exporting countries tends to set a standard towards which British poultry husbandry must work. There is need of improvement in quality and presentation to maintain demand for home produce.

ASHBY (A. W.). **Poultry on General Farms.** *Conf. Papers, Sec. D. Econ. (inc. Marketing). 4th World's Poultry Cong.*

Indicates changes in poultry stocks and some causes of increases. The relative importance of poultry in total farm enterprises on some different types of farms is dealt with and some information on costs and returns is given. There is a discussion of yield of eggs in relation to selling prices and profits, and monthly distribution of production on some mixed farms is given. Yields per hen show great variations. Cost of maintenance of all birds is low on the general farms, but this advantage is lost to the farmer by the low yield and the resulting high cost of eggs. The essential problems of profitable poultry enterprises on general farms have been technical in character, but the problem of marketing, especially as regards quality and the maintenance of demand, is becoming important.

ASHBY (A. W.). **Some Economic Factors in Poultry Husbandry.** *Harper Adams Utility Poult. J.*, Vol. 15/12, 1930.

The tendency towards increase and improvement in production has been accompanied, so far, by an increase in demand and consumption. This increase is symptomatic of general changes in demand for foodstuffs. One danger to continued progress arises from flocks with wide seasonal variations and low quality in production. The question of optimum egg yield for profitable production on general farms is raised, and a suggestion made that there is greater probability of profit at 120 than at 150 or a high yield of eggs per bird. With further increase in total stocks and production more cultivation of markets will be required.

ASHBY (A. W.), assisted by members of staff of Department of Agricultural Economics. **The Agricultural Depression in Wales.** *Welsh Outlook*, 1930, 4 pp.

A brief discussion of causes and of forms of economic depression in agriculture, with summary statements of conclusions regarding effects of changes in selling prices and costs of requirements on farm enterprises—sheep, pigs, dairy herds, beef production, horses, farm crops. If a broad distinction is

drawn, the Highland farms have done fairly well, and the Lowland farms have given less satisfactory results. Over the whole industry real incomes have been lower than normal since 1925. (*See also Proceedings of Conferences*, Agric. Econ. Soc., 1929, pp. 81–86.)

ASHBY (A. W.) and DAVIES (J. Ll.). **Farming Efficiency and the Agricultural Depression.** *Proc. of Conferences, Agric. Econ. Soc.*, 1929.

An attempt to measure efficiency by measuring work output in the form of "land and stock managing capacity" per person, 1871 (1911), 1921, 1924 and 1928. The method employed is that of using hours labour requirement per unit of crops and stock at the various dates. Final indices of *task per person* are: 1871, 100; 1921, 130·5; 1924 and 1928, 137·2. Allowing for reduction in time worked, the indices of *task per hour of labour* are stated as: 1871, 100; 1921, 147; 1924, 152; and 1928, 154. Similar, but greater, increases in efficiency in U.S.A. are noted, the suggestion is made that efficiency in agricultural production tends to rise more rapidly than demand for foodstuffs, hence over-production against effective demand.

ASHBY (A. W.) and DAVIES (J. Ll.). **The Agricultural Ladder and the Age of Farmers.** *Welsh J. Agric.*, Vol. 6, 1930, 13 pp.

A study of the so-called "agricultural ladder" with reference to sources of supply of capital and the age of recruitment of farmers. The highest proportion of male farmers, 47 to 49 per cent., is recruited at the age of 25 to 34 years, and 27 to 29 per cent. at the age of 35–44. Recruitment at the higher age was heavy 1912–21. So far as can be ascertained relatively few farmers completely retire, but numbers of retirements were higher 1912–21 and 1882–91 than in the intervening decade. The indications are that 75 per cent. of farmers are recruited from the class of "relatives." There are opportunities for persons of other origins to enter the industry, but the "ladder" can only exist as a modification of the present system. The logical result of continuing to create small holdings is the shortening and eventually the destruction of the ladder which exists.

DAVIES (J. Ll.). **Horse Labour on Welsh Farms.** *Welsh J. Agric.*, Vol. 6, 1930.

Changes in numbers of horses in Wales and Monmouth in relation to amount of work to be done show tendency to substitute horse for manual labour. The accomplishment of a higher task per man is associated with more extensive use of horse labour. Numbers of livestock and acres of crops per working horse are shown for ten year intervals, 1871–1921, and for 1927, for North and South Wales separately. Changes in nature and amount of horse work required are discussed, and the seasonal nature of demand is indicated. Estimates of the total task per horse in each county in Wales show variations in the ratios of 73 to 131 from the average of 100 for thirteen counties, or from 400 to 718 hours per horse per annum against an average of 547. There is close association between proportion of tillage and amount of work per horse.

HOWELL (J. PRYSE). **Sugar Beet Costs in North Wales.** *Welsh J. Agric.*, Vol. 6, 1930, 22 pp.

A fairly complete review of costs and results of growing sugar beet in the seasons 1926, 1927 and 1928. Average costs and variations are shown, and gross and net costs are analysed according to yield of beet. On the average, profits were realised in 1926 and 1927, but losses were met in the last season. Some details of manuring and cultivations are given, and the place of the crop in reference to rotations and use of labour power is discussed. The economy of this crop in North Wales turns largely upon the eventual recovery of residual values of manures and cultivations, together with use of tops for feeding purposes.

Howell (J. Pryse) and George (Percy). **Rent and Stock Carrying Capacity on some Welsh Farms.** *Welsh J. Agric.*, Vol. 6. 1930, 22 pp.

A study in the theory of rent which uses stock-carrying capacity of pastoral farms, Highland and Lowland, as a measure of quality of land against the actual rents paid on contract (lease or tenancy agreement). The first British essay, so far as is known, in the application of statistical methods to actual farm data in the study of the theory of rent. There is a preliminary discussion of the theory of rent as applied to farm land, a description of the areas in which the farms are situated, simple statistical tables relating to size, rent, stock carried, altitude, and use of fertilisers. Coefficients of correlation are given in detail and dispersion charts are used. Highland farms show a high correlation, but lowland farms show only a low correlation between rent and stock:carrying capacity.

Jones (J. Morgan). **Economeg Amaethyddiath (Agricultural Economics).** *Univ. Wales Press*, Cardiff, 1930, pp. viii + 136.

A text book of agricultural economics in the Welsh language. The subjects treated include land, labour and wages, capital and credit, farm organisation, money and prices of farm produce, marketing farm products, agriculture and the community. A bibliography and an index are given. General principles are stated, with illustrations and in some cases statistical evidence from conditions in Wales. Nearly all the specific data used were collected in the course of various investigations of economic conditions in Welsh farming.

Jones (J. Morgan). **A Review of Agricultural Co-operation in Wales.** *Welsh J. Agric.*, Vol. 6, 1930. 13 pp.

A brief review of the growth of agricultural co-operation in Wales 1902–1928, showing numbers of societies by classes, membership, share capital and turnover. Geographical distribution of societies in 1928 is shown by map. Present-day problems especially of "requisite" societies are discussed, with particular reference to sales, gross profits, costs of financing trade and credit; but other items are dealt with.

Jones (J. Morgan). **Influence of Finance on Results of Co-operative Trading in Agricultural Requisites.** *Co-op. Rev.*, Jan. and Mar., 1930, 11 pp.

An elaborate examination of sources of capital, costs of financing trade, trade credit, and stocks, and their influences on the financial results of trading by farmers' co-operative societies. A "theoretical" standard of capital requirements obtained from a study of successful societies is shown, with a comparison of actual conditions amongst groups of societies. The majority of societies have sufficient capital as a result of accumulation of reserves rather than subscriptions, but a considerable minority are handicapped by lack of capital, and others by "frozen" assets in the form of long credits.

Jones (J. Morgan). **The Study of Farm Labour in Germany.** *J. Proc. Agric. Econ. Soc.*, Vol. 1, No. 3, Dec., 1930.

A brief discussion of some of the objects and methods of the study of *Landarbeitslehre* in Germany, being part of the conclusions reached during a personal visit to German institutions engaged in investigations. The general purpose of critical and systematic investigations is the improvement of the labour element in agriculture so that as much and as good work as possible may be done with as little application of energy as need be, and so that the amount of labour used and its result may stand in a favourable relation to each other. Labour organisation on the farm, tools, task-work,

time and output, work-motions and conditions of fatigue, systems of wage-payment, are studied *inter alia*. "After only a decade of investigation the workers in *Landarbeitslehre* have reason to be proud of the contribution which their farming science has made to the solution of Germany's post-war problems."

JONES (W. H.). **A Survey of the Agricultural and Economic Conditions of a Parish in Carmarthenshire** *Welsh Housing and Development Yr. Bk.*, 1930. Pub. by Welsh Housing and Development Association, 38, Charles Street, Cardiff. (Reprinted.) (pp. 27).

An elaborate survey of conditions in a pastoral parish, mainly of small farms. Details include sizes of farms, use of land, livestock, persons engaged, capital and equipment, sales, purchases and income. In the discussion of income distinction is drawn between produce consumed and income in cash, and between income per person and per labour unit (i.e., whole-time worker). In six groups of farms, classified by size, profits shown are little more than sufficient to pay interest on capital on the largest of the milk-selling farms, and not sufficient to pay normal interest in the milk-selling farms of medium size; while on the smaller milk-selling farms and three groups of butter-making farms the "profits" or incomes are not equal to wages at the rates paid to agricultural employees.

LEWIS (T.). **The Production and Marketing of Pigs in North Wales and Cardigan.** *Welsh J. Agric.*, Vol. 6, 1930, 11 pp.

This study contains part of the results of a regional survey of livestock marketing conducted by the author. Details of market movements of pigs, "exports" to England, relative importance of market destinations, and seasonal movements are given. Breeds and their geographical distribution are discussed in relation to markets for types of fat pigs, and various systems of marketing are described. Part of the unorganised character of markets is due to the unorganised systems of production. Better market information is required to stimulate greater supplies, better adapted to market demands. The first step in improvement is closer discrimination in prices paid on the basis of varying qualities.

WILLIAMS (J. GLYNNE). **Types of Sheep in Three Counties of Wales.** *Welsh J. Agric.*, Vol. 6, 1930, 7 pp.

This and the following paper represent part of the *technical* results of a survey of sheep-husbandry in Wales. The extreme variety of breeds and crosses used in fat-lamb production is clearly indicated by figures showing the relative numbers of ewes and rams of each breed used. Some reasons for changes in foundation stock are discussed.

WILLIAMS (J. GLYNNE). **Types of Mountain and Hill Sheep in Wales.** *Welsh J. Agric.*, Vol. 6, 1930, 6 pp.

Describes and discusses mountain breeds of sheep—Welsh Mountain, Kerry Hill, Cheviot, Radnor and Scotch Blackface—in relation to pastures and climatic conditions, and the use of breeds and crosses for market production.

WYNNE (R. HARDING). **The Comparative Trend of Prices of British and Imported Dairy Products.** *Welsh J. Agric.*, Vol. 6, 1930.

By tables and charts the ratios of prices of English butter and cheese to prices of imported varieties are shown for the period 1906 to 1928. The premium on home produced butter is diminishing. Generally, English Cheddar chesee has maintained a price advantage over other types throughout the period, but price ratios have been far from constant. The influence of standardisation and improvement of quality in imported dairy products has important effects on British production.

ARMSTRONG COLLEGE, NEWCASTLE-UPON-TYNE.

DINSDALE (D. H.). **Sugar Beet 1929 in the Northern Counties.** 20 pp. Armstrong Coll., Newcastle-on-Tyne.

This bulletin summarises the results of an investigation carried out during the winter of 1929–30 into returns from Sugar Beet growing in the four northern counties; this being the fourth successive survey carried out by the Department on this subject. Acreages in the counties of Northumberland and Durham have steadily declined since 1927, whilst the crop was grown on a commercial scale in Cumberland and Westmorland for the first time in 1929.

An analysis of growers over a four years' period shows that in Durham, out of 138 farmers who have grown the crop at all during that time, 22 only have grown four successive crops, while in Northumberland only three out of 126 have done so. The numbers of growers each year and the acreages have been maintained by extensions of the campaign into new areas. The average acreage per grower was between two and three acres over the four counties so that the crop cannot be said to have established itself as a feature of the farming in this area.

The average yields of washed beet per acre were, in Durham 8·05 tons, in Northumberland 8·058 tons, and in Cumberland and Westmorland 6·112 tons. The average for England and Wales was 8·7 tons. An indication of the distribution of yields is given as follows:—

In Durham, out of 21 cases, 9 were below 8 tons per acre.
In Northumberland, out of 48 cases, 31 were below 8 tons per acre.
In Cumberland and Westmorland, out of 41 cases, 32 were below 8 tons per acre.

The sugar content throughout the area was below the average of the country, and particularly so in Cumberland and Westmorland.

The financial returns (gross) to the grower may be illustrated thus:—

In Durham, out of 21 growers, 15 received more than £18 per acre (gross).
In Northumberland, out of 48 growers, 23 received more than £18 per acre (gross).
In Cumberland and Westmorland, out of 41 growers, 10 received more than £18 per acre (gross).

The average gross financial returns per acre for the four northern counties were Durham, £21 16s. 8d.; Northumberland, £21 7s.; Cumberland and Westmorland, £13 8s.

Generally, the survey has indicated that unless better yields can be obtained from the expenditure of labour and other resources devoted to the crop, the decline in the acreage under sugar beet may be expected to continue.

BRISTOL UNIVERSITY.

DAWE (C. V.). **Agricultural Accounting in Wiltshire.** *J. Min. Agric.*, Aug., 1930.

DAWE (C. V.). **The Wiltshire Agricultural Accounting Society—Analysis of Four Years' Financial Results.** *Univ. Bull.*, Sept., 1930.

Both publications deal with the same subject, namely, the financial results of four years (1925–28) of farming in Wiltshire. Continuous records were available from 25 farms. The bulletin is a much more detailed report of the results than was given in the article in the Ministry's Journal. In

it are given tables of total costs, output and capitalisation of these farms, with considerations of output in relation to rents, labour and foodstuffs bills. Capital turnover, profits and losses in relation to type of farming are also examined.

DAWE (C. V.). **The Economic Classification of Farms as a basis of Agricultural Advisory Work.** *Paper read at the 2nd Internat. Conf. of Agric. Economists* at Cornell University, New York, Aug., 1930.

This paper pointed out the need for an agreed classification of farms in order to facilitate the comparison of economic results from farms in different parts of the same country or of different countries. The wide variations found in farming in a country like England made such a classification, arbitrary though it may be, of considerable importance, not only to the economist but to County Organisers and others. It was suggested that use of methods in statistical correlation might help to prepare the way and that refinements could come later when, for example, soil surveys had been made.

DAWE (C. V.). **The Work in Agricultural Economics at Bristol University.** *Paper read before Sect. M. of the Brit. Assoc.* at Bristol, Sept., 1930.

The development of the work in agricultural economics in the Bristol Province was described in this paper.

CAMBRIDGE UNIVERSITY.

BURGESS (C.). **Sugar Beet in the Eastern Counties, 1928.** *Farm Econ. Bch. Rep., No.* 13, pp. 72, price 2s. 6d. net, postage 3d.

This Report is the second of a series dealing with the economics of sugar beet growing in the Eastern Counties Province, and refers to the crop season 1928. Its predecessor (F.E.B. Report No. 9) referred to the 1927 crop, and, on account of the very diverse climatic conditions associated with these two seasons, comparison of the results achieved in each is particularly interesting. Further, the 1928 season was the first in which prices to the producer were affected by the reduced Government Subsidy. The Report details the costs of growing over 2,000 acres of beet distributed throughout the Province. A brief résumé of the results achieved in the two seasons 1927 and 1928 is given.

A full discussion of the factors influencing the results is also given, the data being grouped and analysed by soil types, size of field, manuring, distance to factory, etc.

The report concludes with sections dealing with the significance of plant population, the value of by-products, and the "Morton and Standen" harvester.

BURGESS (C.) and GRAVES (P. E.). **Sugar Beet in the Eastern Counties, 1929.** *Farm Econ. Bch. Rep.*, No. 16.

This publication is the third and final Report on an investigation into the financial results of Sugar Beet growing and the principal factors which influence them. The previous publications dealt exclusively with the 1927 (*Report No.* 9) and 1928 (*Report No.* 13) crops, and the present one details the 1929 results, and summarises the three years' experiences.

The Report details the component items of the over-all costs and returns per acre, and illustrates the effects of variations in the mode of production, in soil, and in climatic and other conditions. Special attention is given to the results of manuring, both with dung and artificials, while the effects of sub-soiling, of different rates and dates of drilling, of different spacing,

etc., are shown. Sugar content fluctuations are traced, and an optimum lifting period is suggested. Year to year comparisons are made, and causes of variation examined. In the light of the material which has been collected certain suggestions are propounded for the consideration of those who are responsible for the fixing of contract prices.

CARSLAW (R. McG.). **The Application of Farm Management Data to Farm Practice in the United States of America.** Printed privately by the Agricultural Economics Society.

This paper sketches the development of farm management research in the United States, and describes briefly the evolution of technique through the three stages of (*a*) full cost, (*b*) survey, and (*c*) financial accounts, since 1902 to the present day. The type of results which have been obtained from these three methods, and the value which they possess for advisory work, are outlined.

CARSLAW (R. McG.). **The Scope of Farm Management Research.** *Camb. Univ. Agric. Soc. Mag.*, 1930.

This paper defines the term "farm management," and suggests certain problems which merit investigation.

CARSLAW (R. McG.). **The Effect of Size and Shape of Fields on Costs and Returns.** *J. Yorks. Agric. Soc.*, 1930.

An article, written for farmers, drawing attention to the economic aspects of size and shape of field.

COHEN (R. L.). **Factors Affecting the Price of Potatoes in Great Britain.** *Farm Econ. Bch. Rep. No.* 15.

This study represents an attempt to explain the course of potato prices in England from 1885—when the Board of Agriculture first collected returns of yield per acre and amount of production—up to the present day. Relevant data available as to amount of production, yield per acre, acreage and imports are examined to see how far their movements in relation to price are explicable by economic theory.

A consideration of the general direction of these various factors—both before and after the war—indicates that potato producers would in general have received a larger aggregate sum had they produced less. The post-war figures for retail prices and production seem, however, to indicate that during this period consumers paid the maximum aggregate sum for their potatoes.

It further appears that variability in price results from alterations in supply (of which home production provides over 90 per cent.). Again, home supply, and hence home price, would be more variable if imports of main crop potatoes were excluded. One of the clearest results that emerges from this investigation is that, both over a period of years, for yearly fluctuations, and, to a certain extent, for monthly changes, imports move in the same direction as prices and are, therefore, more a result than a cause of price changes.

Home production—the important factor as regards prices—varies largely as a result of alterations in the yield per acre. Fluctuations in acreage—following changes in price usually after a lag of 12 to 21 months—though of considerably less importance—are yet not negligible. Changes in yield are not sufficiently regular for it to be possible to advise farmers to alter their acreage in the opposite direction. Hence, apart from attempts to stabilize yields, no substantial steps can be taken to stabilize retail prices from year to year.

But two lines of improvement remain. By co-operation or other means the fluctuations in growers' prices might be reduced to a level more comparable with those of retail prices. Further, by the spread of information, intra-seasonal fluctuations in price—which this study has indicated as being excessive and to the disadvantage of the English farmer—might be made less violent.

WESTON (W. A. R. DILLON) and ENGLEDOW (F. L.). **The "Money" Side of Bunted Wheat.** *Essex F.U. Yr. Bk.*, 1930.

Many farmers still attach little importance to bunt. This disease not only reduces yield but lessens the value of the produce. Experiments were made to ascertain the degree of bunt infection which the purchaser would be likely to detect and the relation between extent of infection in the seed sown and in the resulting crop. It appeared that if in a crop 1 plant in every 1,000 were bunted a miller would deduct sixpence per quarter in purchasing the grain; with 1 plant in every 500 infected he would deduct 1s. 6d. A crop bunted to the extent of 1 plant in every 500 might, in practice, easily result in the following way:—

1st year.—A crop is very slightly bunted—say 1 plant in every 9,000. Seed from this crop is sown without being dressed and in the

2nd year, the crop has 1 bunted plant in every 500. The grain is sold for seed and the miller offers 1s. 6d. below current rates because of the bunt.

3rd year.—If the grain from the 2nd year were sown without dressing the resulting crop would be so bunted as to be unsaleable.

KIRKPATRICK (W. H.). **The Seasonal Distribution of Farm Labour Requirements.** *Farm Econ. Bch., Rep. No.* 14.

Compared with pre-war years, the cost of farm labour at the present day may be said to be approximately twice as expensive per worker, while the labour bill alone represents as much as 30 per cent. of the total farm payments in the Eastern Counties. It is because of this that the question of the profitable utilisation of the labour staff assumes such great importance at the present time. The only desirable method of decreasing the incidence of wages in the cost of production is to increase production per worker while maintaining wage rates. That on many farms great scope exists for increasing the efficiency of the application of labour is apparent. The establishment of certain "standards" in the organisation of the labour staff should do much to assist the individual farmer to deduce from his own records some idea of where and by how much his organisation falls below "average" efficiency.

This Report suggests standards to be achieved in the work necessary for those enterprises common to farming in the Eastern Counties. The data represent the labour requirements of those enterprises and the seasonal demands they make on the labour staff of the farm. Diagrams are used throughout the text. These illustrate the periods at which crops and live-stock call for the greatest attention, how various crops (e.g., sugar beet and mangolds) require a maximum application of labour during the same seasons, and the way in which a more regular distribution of labour throughout the year may be effected by the growing of both autumn and spring sown crops. A short discussion is also introduced as to the causes which determine the volume of work done in a unit of time, more especially in relation to the growing of crops.

LEEDS UNIVERSITY.

RUSTON (A. G.). **Grass or Arable Farming.** *Berks. Farmers' Yr. Bk.*, 1930.

From 1870 to the outbreak of the war the arable land in this country went down to grass at the rate of approximately 73,000 acres a year; from

the end of the war to the present time it has gone down to grass at the average rate of 223,000 acres a year or more than three times as fast. The points discussed are:—

(*a*) Does this matter?
(*b*) Has the policy been wise from the national standpoint?
(*c*) Has it been sound in the light of present day labour problems?
(*d*) Has it been sound economically from the point of view of the farming community?

RUSTON (A. G.). **What should a Farmer Produce?** *Essex F. Yr. Bk.*, 1930.

A study of the records collected during the past 10 years suggests:—

The salvation of British Agriculture is not to be found along the lines of ranch farming and diminished production, but if the industry is to come to its own again it must do so by means of an increased output and increased sales.

The farmer should produce if possible something which will give a high capital turnover, ready money and quick sales; something which is safe; the type of produce which is to a greater or less degree naturally or artificially safeguarded and protected; *but he must* produce something which he can sell and sell at a profit; something for which there is a demand and something for which his individual holding is best adapted.

RUSTON (A. G.). **Some Aspects of Cost of Production Studies.** *Rhodesian Agric. J.*, Mar., 1930.

What is required on the ordinary farm is some simple and none too complicated system which will give to the individual farmer the maximum amount of information with regard to his farm management with the minimum amount of trouble to himself.

The point is emphasised that it is in the critical examination of the records which the books provide that their real value lies, and unless the books can be made to talk, it is almost a waste of time keeping them.

The value of survey methods and purely financial accounts is discussed, but the conclusion arrived at that it is only when some modified or complete system of cost accounts is being kept that the fullest use can be made of the books as an aid to farm management.

RUSTON (A. G.). **The Economics of Poultry Keeping.** *Federated Poultry Soc. H.B.* 1930.

The economic importance of poultry on the farm, though not yet realised to the full, is year by year becoming more and more apparent to the farming community, and one is now beginning to find an ever-increasing number of holdings which are specialising to a greater or less degree in this direction. A few years ago it was difficult to find in our own county of Yorkshire any ordinary commercial farm on which poultry were receiving any but the most casual attention. To-day we are closely and intimately in touch with 11 commercial farms on which at least a thousand laying birds are being kept. Their real value lies in the regularity and the continuity of their sales and the largeness not only of the gross but also of the net returns left by them.

RUSTON (A. G.). **There is Money in Poultry.** *Farmer and Stockbreeder*, Feb. 3, 1930.

A description of the growth and development of a farm of 60 acres handicapped by position, lack of marketing facilities and shortage of capital; an inconvenient and scattered holding originally badly equipped and possessing little or no security of tenure, but which during the last three

years has produced for sale goods to the average annual value of £3,200, and left an average net profit of more than £800 a year; a success which would have been almost, if not quite, impossible but for the part played by poultry.

RUSTON (A. G.). **The Foundations of Success.** *Farmer and Stockbreeder*, Aug. 25th, 1930.

A description of the working of a small holding of 48 acres, which did quite well financially up to the time when 8 acres of grassland were transferred from this to another holding; when the man failed to make the necessary adjustments and was thrown off his balance, which he has never yet recovered.

If a man wants to make money out of farming to-day he will find that it is not sufficient to be a skilled craftsman; more than technical efficiency is required on the side of production. The successful man to-day must be able to adapt himself and his methods to meet present-day needs and requirements.

New problems are continually to be faced and the solution of most of the present day problems of practical farm management is to be found by the head rather than by the hand.

RUSTON (A. G.). **Handicaps to Union Farming.** *Farmers' Weekly*, Bloemfontein, 8th Jan., 1930.

While nature has so bountifully endowed South Africa with natural resources she has also placed a series of obstacles in the way which prohibit these natural endowments from being employed to their full advantage by the agriculturist. Its soil is good, its climate is all that one could wish; practically every type of vegetation, temperate, sub-tropical and tropical can be found to grow there and grow luxuriantly, but its problems, geographical, natural, agricultural, economic and social, are as varied and diversified as its vegetation.

It is not without significance that in spite of the vast actual and potential mineral and agricultural wealth and natural resources of the country, the growth rate of European settlement has been so slow.

RUSTON (A. G.). **What Types of Union Farming Pay?** *Farmers' Weekly*, Bloemfontein, 15th Jan., 1930.

Most branches of South African Agriculture are reviewed, including the part which it is hoped South Africa will play in helping to solve the two big imperial problems which are centred round cotton and tobacco. The growth of the deciduous fruit industry in the Cape Province and the rapid strides made in citrus growing have been as remarkable as the improvements in the marketing methods of these products, while possibly the most pleasing feature of South African agriculture is the development of wool production.

There is a future for South African farming and that future will be more fully assured when the white population has learnt to forget whether it is Boer or British and to remember only that it is South African; when the standard of living of the native has been raised; when the land is utilised to fuller advantage; the output or production from the farms increased, and marketing facilities developed to a greater extent even than at present.

RUSTON (A. G.). and WITNEY (D.). **Pig Keeping Ancient and Modern.** *Pig Breed. Ann.*, Feb., 1930.

A broad historical survey is made of trends in pig management from the earliest times to the present day, with appropriate illustrations drawn from mediaeval and contemporary sources and a map depicting a mediaeval Yorkshire manor. After dealing with the first period from Saxon times to the 18th Century when the pig was expected to forage for its own living in the woods and wastes of the manor, the article passes on to the second

period (1750–1900) during which improved breeds are evolved but are sty-fed on a deficient ration causing a loss of stamina and constitution, and thence on to the third period marked by scientific pig feeding and pig-keeping on modern lines, developed between 1900 and the present day.

We have travelled a long way along the lines of herd management, but we may congratulate ourselves upon the fact that by far the greater part of that road has been traversed during the lifetime of the present generation.

MIDLAND AGRICULTURAL COLLEGE.

JONES (A.). **The Need for improved Organization of Milk Marketing in Derbyshire.** *Derbyshire Farmer*, Vol. 9, No. II.

Describes briefly the distribution of the many different types of milk producing holdings throughout the county and the diversity of methods of disposal. Outlines the marketing methods adopted, touching on the weakness of the individual bargaining by the producer-wholesalers and the evils of underselling and overlapping amongst producer-retailers. Remarks the dependence of small producers in remote areas on large firms collecting and suggests pooling for manufacture or bulk consignment as a practical alternative to present methods of disposal. Stresses the need for efficient organization and loyalty to ensure the success of co-operative centralizing depots.

JONES (A.). **Celery Production and Marketing in the Isle of Axholme.** *Survey Studies No.* 1. Midland Agric. Coll., p. 65.

This report deals with the whole technique of celery production and marketing. Soil types, classes of holding, rotation, manuring, cultivations and lifting are carefully described in the section on production, whilst the marketing of the crop is examined. Factors governing choice of market and present methods of disposal are outlined noting the advantages and disadvantages of the systems. Prices are analysed, market variations and the influence of locality are noted, whilst the advantages of grading and good packing are defined. The method and results of a celery grading experiment are described, showing the expenses and returns from grading and the grade margin. Finally, detailed crop costs, obtained from thirty recording growers, are set out and criticised.

READING UNIVERSITY.

THOMAS (E.). **Changes in the Size of Agricultural Holdings in England and Wales during the last 100 years, with particular attention to small holdings and the problems of small holdings.** *Proc. Internat. Conf. Agric. Econ.*, 1929.

The changes in size of farms in England and Wales are studied in so far as these are reflected in the official statistics which have been collected since 1870. The limitations of these official figures are dealt with and, having regard to such limitations, the conclusion is drawn that no fundamental changes have occurred during the period reviewed. The present-day position with respect to size of farms is then examined. So far as numbers are concerned the prevalent belief that England is a land of large farms is shown to have no basis in fact, and the preponderance of small and medium-sized holdings in England and Wales is emphasised. The classification of the small farms of the country which is attempted is necessarily restricted by the incomplete statistical data available for this purpose. It is established, however, that it is only in the matter of size that most of the small farms of England and Wales differ from the big farms in their immediate neighbourhood, and the economic significance of this fact is discussed.

SEALE HAYNE AGRICULTURAL COLLEGE.

LONG (W. H.). **Sugar Beet Costs in Devon and Cornwall, 1929.** *Seale Hayne Agric. Coll.*, Newton Abbot, Devon.

The pamphlet is based on a survey of the sugar beet crop on 106 Devon and Cornwall farms in 1929. In Part I, the financial aspect of the crop is discussed, a money value having been assigned to each operation performed on it. The 1929 crop averaged a yield of 12·16 tons of washed beet per acre, and a sugar content of 17·8 per cent. The cash receipts amounted to £31 10s. 4d. per acre, and the total cost was £25 7s., leaving a cash profit of £6 3s. 4d. per acre, and 10s. 2d. per ton of washed beet. The presumed real profit, after adding the value of tops, and the residual values of manures and cultivations, was £11 17s. 9d. per acre, and 19s. 7d. per ton.

There are four main beet growing areas in Devon and Cornwall, and average costs and returns are given to each group.

Sections are devoted to the effect of manuring, to the date of sowing and the distance between the rows and between the plants at which the crop was grown, to the cost of lifting and of haulage, and to the rent per acre.

Part II considers the sugar beet crop in its relation to other crops on the farm. It was found that in three-quarters of the total number of cases, beet displaced a root crop in the rotation. In other words, a cash crop, averaging a return of £31 10s. 4d. per acre, gross, was introduced instead of one usually fed on the farm. Against this, extra expenses were incurred in labour, manures, purchase of dried beet pulp in several cases, haulage and transport.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

KNOX (M. A.). **The Cost of Tractor Work on the Farm.** *J. S.E. Agric. Coll.*, 1930, pp. 209–213.

The cost of tractor work on nine farms and covering 50 tractor years up to Michaelmas, 1929, is summarised. The yearly cost per tractor was found to average £104 for 740 hours worked. Driver's time, other than on repairs and overhaul, is not included in this figure, which consists of depreciation (28·5 per cent. of the total cost), repairs and renewals (24·4 per cent.), fuel and oil (46·6 per cent.) and sundries (0·5 per cent.).

The average cost per hour was 2s. 10d. over the 740 hours worked per tractor, but since depreciation forms a more or less fixed charge and has to be spread over the number of hours worked, the individual costs were shown to depend very largely on the amount of work the tractor was given to do. This feature was reflected in the costs on individual farms, which varied from 1s. 5d. to 4s. 5d. per hour.

The alternative method of apportionment of the cost of tractor work, on the basis of (*a*) hours worked, and (*b*) fuel consumption, was considered.

The advantages of a tractor as regards special or urgent work are appreciated, but emphasis is laid on the possibilities of keeping the cost of such special work as low as possible.

WYLLIE (J.). **Investigation into Farming Costs of Production and Financial Results.** *Report No. VIII.* General Report on Six Years' Results, pp. 213–288.

This report has two objectives: (*a*) to present and discuss the results obtained from the *financial accounts*, the cost-accounting results being dealt with in the separate reports on the various enterprises, and (*b*) to discuss the technique of investigational work of this kind.

The difficulties involved in trying to measure managerial efficiency on the basis of financial accounts alone have been fully discussed and two general

conclusions are (*a*) that what the individual farmer needs most of all is some system of recording *internal* farm transactions in such a way as to be able to test his efficiency for himself, and (*b*) that financial accounting can never be as useful to the individual farmer in testing his efficiency as the keeping of records such as time sheets, foodstuffs records, yield records, and so on.

WYLLIE (J.). **Investigation into Farming Costs of Production and Financial Results.** *Report No. IX.* Pig Keeping Costs and Financial Results for Six Years, pp. 289–312.

The loss on pig keeping on seventeen farms, covering sixty-six farming years, between Michaelmas, 1923, and Michaelmas, 1929, amounted to £2,983, equivalent to about 21 per cent. per annum on the capital invested in pigs and pig equipment *before* charging interest on capital or managerial salaries, whether these were paid or not.

The only year in which profits were consistently shown was 1925–26, when pigs were comparatively high and pig-meals comparatively low in price.

The report brings out very clearly the extent to which the net financial result in pig keeping depends upon two factors, viz., (*a*) the price level of pig meals, and (*b*) the price level of porkers, baconers and stores. On the average, the cost of feeding formed about 77 per cent. of the total expenditure on pigs, while the receipts from pigs sold formed about 92 per cent. of the total income. It would appear that in order to ensure a gross return of about 15 per cent. per annum on the invested capital, the price of porkers and baconers would have to be about 12s. 6d. to 13s. 6d. per stone of 14 lbs., when the price of pig meals was about £8 to £9 per ton, with eight to twelve weeks old stores about 34s. per head.

The need for a more detailed, special investigation into pig feeding, with a view to laying down standards by which the pig keeper might measure his efficiency at various points, is emphasised and the co-operation of pig keepers within the College province in such an investigation is invited.

WYLLIE (J.). **Investigation into Farming Costs of Production and Financial Results.** *Report No. X.* Sheep Breeding and Feeding over Six Years, pp. 313–346.

A general account is given of the structure of a cost account for sheep and some of the difficulties which arise are briefly discussed.

Results are given from sheep-husbandry on sixteen farms, covering sixty-one farming years between Michaelmas, 1923, and Michaelmas, 1929, showing an average loss per farm per annum of £91, equivalent to about 9½ per cent. per annum on the invested capital, before charging interest or managerial salary whether these were actually paid or not.

The results from six farms on which breeding flocks were kept to a certain extent on the fold and on another six farms on which a breeding flock was kept mainly or entirely on the pastures are given in detail. The results from the "folding" farms are very unsatisfactory, chiefly on account of the comparatively high feeding and labour costs. One of the most striking results is that on most of these farms the sheep would have shown a loss even if all the folding crops had been given to them for nothing.

A marked feature of this six-year period is the number of changes which have been made either in respect of the number of sheep kept, the breed, the system of feeding, or the general management.

WYLLIE (J.). **Standards of Efficiency in Milk Production.** *Essex F.U. Yr. Bk.*, 1930, pp. 231–235.

Much is heard about efficiency in farming; little about how that efficiency can be measured. In this article a method of testing efficiency in the cowsheds is briefly described and illustrated. Regarding the cowshed as a

"factory" and the cows as "machines," then it follows that efficiency must have some relation to the quantity of "food" required to produce unit quantity of milk. The conversion of foodstuffs into a common denominator —the "starch equivalent"—is a familiar enough process nowadays, and although difficulties arise in connection with grass, straw and sundry green foods experience shows that efficiency in the cowsheds can be measured more accurately on this basis than in any other way.

WYLLIE (J.). **Some Aspects of Economic Milk Production.** *J. Farmers' Club*, May, 1930, pp. 71–80.

This is a paper delivered before the Farmers' Club. Three questions are asked, viz.: (1) What do we mean by "a good cowman," by "good cows"? (2) How are we likely to get them; and (3) What do we mean by "good management"? and after emphasising the desirability of doing something to encourage a "good cowman" to give of his best, and the importance of a strong constitution in the dairy cow, a discussion is opened on the question of what constitutes good management in milk production. Examples are given of the way in which the cost of labour per gallon varies according to the number of cows in the herd and the average milk yield per cow; a rational method of calculating "depreciation" on the cows is illustrated; and the method of checking efficiency, to which reference is made in the article mentioned above, is explained. This paper was followed by a full discussion.

WYLLIE (J.). **Some Popular Fallacies about Farming.** *J. S.E. Agric. Coll.*, 1930, pp. 220–224.

In this broadcast talk an effort is made to correct some of the misconceptions about farmers and farming which are commonly found amongst the general public. Some of these misconceptions are: (1) that if farmers look after *Production*, then *Profit* can be left to look after itself; (2) that English farmers are far too slow to avail themselves of methods of increasing production; (3) that since sales of corn amount to only about 10 per cent. of the total sales of farm produce in this country, it *must* be wrong to say that corn-growing is the back-bone of English farming; (4) that there is room for a great increase in the use of "labour-saving" machinery, despite the fact that 88 per cent. of English farms are not over 150 acres in extent; (5) that English farmers know nothing at all about marketing and that all their financial troubles can be solved by so-called modern methods of marketing.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

WHITTAKER (E.). **Economic Advisory Work in the College Area.** *Coll. Bull., New Series No. 2.*

A general description of the investigation of farm financial accounts at the College is given. The method of research adopted, having regard to special conditions in the area, is indicated briefly.

There follows an account in some detail of the first sub-group of farms studied. The character of the farms, the variations found in financial results, and the manner in which it was sought to trace the causes of this variation, are described.

WHITTAKER (E.). **The Mobility of Agricultural People.** *Paper read at the 2nd Intern. Conf. Agric. Economists.* Cornell Univ., Ithaca, U.S.A., Aug., 1930.

Classical theories suggested that, if free movement between one occupation and another was possible, wages and profits would equate the relative advantages of different employments. In fact, however, mobility is far from being complete. An important task of the economist is to discover the extent of movement, and, if necessary, to devise means of assisting it.

Research in the Edinburgh area points to mobility being more free amongst large-scale tenant farmers than is indicated by experience elsewhere. Various factors governing mobility, and implications which appear important, are suggested.

(R) PRESERVATION AND TRANSPORT.

LONG ASHTON FRUIT RESEARCH STATION.

BARKER (B. T. P.). **Fruit Products and Associated Problems.** *Paper read before Imp. Hort. Conf.*, Aug. 6th, 1930.

The increasing importance of fruit products to the commercial fruit grower is discussed.

Following a general review of the various classes of products and the directions in which the application of pure science may be of advantage, the particular case of cider is considered in more detail. The problems on which research has led to practical results and those offering further opportunities to the scientific investigator are indicated.

BARKER (B. T. P.) and GROVE (O.). **The effect of low temperature storage on cider.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

A paper describing the influence of cold storage upon bottled cider. Thirty-six varieties of cider were tested. It was found that storage at 33°–34° F. over a prolonged period checked the processes associated with the ageing of ciders. No considerable chemical change occurred at that temperature, the cider retaining its fresh and fruity character. No serious formation of deposit or flavour deterioration was observed. Differences in the behaviour of the individual ciders were of a minor character.

GROVE (O.). **Cidermaking Trials for the Season 1928–29.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

A description is given of the ciders and perries made from 176 samples of fruit entered in the annual competition of the Institute. The analyses of the juices are recorded, and observations on features of interest in individual cases and a review of the general quality for the season are included.

GROVE (O.). **Some trials with new types of cider filters.** *Ann. Rep. Agric. and Hort. Res. Sta.*, Long Ashton, 1929.

Experiments with two new types of filters are described. One of them in particular, in which the filtering material eliminates all micro-organisms, gave very satisfactory results. The filtered cider remained free from any growth of organisms and showed very little change in character after a prolonged period of storage in bottle.

FRUIT AND VEGETABLE PRESERVATION RESEARCH STATION, BRISTOL UNIVERSITY.

HIRST (F.) and ADAM (W. B.). **Springers, Hydrogen Swells and Perforations in Canned Fruits.** *Canners' Bull. No. 1 of the Fruit and Vegetable Preservation Res. Sta., Campden, Glos.* May, 1930.

This Bulletin, which reviews the results of research work carried out in America and England, has been prepared for the benefit of the rapidly growing canning industry in this country. It advises the canner how to prevent losses due to corrosion of the container in canned fruits.

HIRST (F.) and ADAM (W. B.). **The Use of Sugar Syrups in Fruit Canning.** *Canners' Bull. No. 2 of the Fruit and Vegetable Preservation Res. Sta., Campden, Glos.*, June, 1930.

The reason for adding sugar to canned fruits is given. The various hydrometers used in the canning industry are described, and the importance of making density measurements is emphasized. The methods of measuring the density are given in detail. Some tables useful to the canner are included.

HIRST (F.), ADAM (W. B.) and ADAMS (M. L.). **Domestic Preservation of Fruit and Vegetables.** *Min. Agric. Bull. No.* 21, Oct., 1929.

The various methods of preserving fruit and vegetables in the home are described in detail.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

CODLING (A. J.) and WOODMAN (H. E.). **Sugar Beet Pulp as a Source of Pectin.** *J. Agric. Sci.*, xix, 701, 1929.

It is shown that dried sugar beet pulp contains about 35 per cent. of pectose. Although beet pectin resembles the pectins from other sources in its general physical and chemical characteristics, it is sharply differentiated from apple pectin in its inability to impart a jelly condition to syrups containing suitable amounts of cane sugar and free acid. The reason for this absence of jellying power is not clear, though apparently it is not connected with the nature and amount of the mineral impurities in the pectin preparations. Nor is it to be ascribed to any changes in the character of the pectose in sugar beet pulp during the factory process of drying the wet material. It is concluded, therefore, that the proposal for utilising sugar beet pulp in the industrial processes of making jams and fruit jellies must, for the time being at any rate, be set aside.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

ADAIR (G. S.). **The Thermodynamic Analysis of the Observed Osmotic Pressure of Protein Salts in Solutions of Finite Concentration.** *Proc. Roy. Soc.*, 1929 (A), **126**, 16.

The observed osmotic pressure of a solution of a protein salt has been analysed in terms of the partial osmotic pressure of the protein ions themselves and the "ion pressure difference."

ADAIR (G. S.) and CALLOW (E. H.). **The Osmotic Pressure of Concentrated Solutions of Gelatin in Equilibrium with Solutions of Magnesium Chloride.** *J. Gen. Physiol.*, 1930, **13**, 819.

The equilibrium of concentrated solutions of gelatin and of magnesium chloride has been investigated and an attempt made to estimate the effects of some of the factors responsible for deviation from the laws for dilute solutions formulated by Loeb.

BARKER (J.). **Wastage in Imported Fruit, Its Nature, Extent and Prevention.** *Food Investig. Sp. Rept. No.* 38, 1930. H.M. Stationery Office.

The factors concerned in wastage are discussed. Apples, pears, plums, peaches, grapes, citrus fruit, bananas, pineapples and tomatoes have been examined and brief descriptions of the various types of wastage and of losses they cause are followed in each case by a discussion of methods of prevention.

Other chapters deal with wastage and overseas transport, wastage during marketing and the prevention of wastage, the last-mentioned being essentially a summary of the report.

BARKER (J.). **Prevention of Wastage in New Zealand Apples.** *Food Investig. Sp. Rep. No.* 39, 1930, H.M. Stationery Office.

An investigation to ascertain how conditions of temperatures in ships' holds affect the apples exported from New Zealand to Great Britain. The method of "split consignments" was used. Wastage in commercial shipments of New Zealand apples in 1928 and 1929 was due chiefly to fungal rotting and to a lesser extent to physiological diseases. The effects on the different forms of wastage of certain pre-shipment and post-shipment factors have been considered.

BROOKS (J.). **Post-mortem Formation of Methaemoglobin in Red Muscles.** *Biochem. J.*, 1929, **23**, 1391.

Some factors concerned in the formation of methaemoglobin in pigmented muscles are considered. As the formation of methaemoglobin in lean meat was not observed in the absence of oxygen, the depth of penetration of oxygen into the tissue was studied. Some effects of freezing and thawing were investigated.

CALLOW (E. H.). **The Determination of Sucrose by Hane's Modification of the Hagedorn-Jensen Method.** *Biochem. J.*, 1930, **24**, 57.

GLENNIE (A. E.). **Index to the Literature of Food Investigation.** Vol. 1, No. 2, Sept., 1929.

GLENNIE (A. E.). **Index to the Literature of Food Investigation.** Vol. 2, No. 1, Mar., 1930.

HARDY (W. B.). **The Industrial Value of Technical Education.** *Proc. Brit. Assoc. Refrigeration*, 1929, **25** (No. 2), 21.

KIDD (F.) and WEST (C.). **Gas Storage of Fruit. II. Optimum Temperatures and Atmospheres.** *J. Pomol. & Hort. Sci.*, 1930, **8**, 67.

A study of the effects of storing apples in atmospheres of regulated composition. The interaction of the three variables, temperature, concentration of carbon dioxide and concentration of oxygen, in the storage of Bramley's Seedling apples was investigated.

KIDD (F.) and WEST (C.). **Physiology of Fruit, Part I. Changes in the Respiratory Activity of Apples during their Senescence at Different Temperatures.** *Proc. Roy. Soc.*, 1930, B, **106**, 93.

The respiratory history of an apple during ripening is characterised by a rise followed by a fall in activity. The rise is attributed to a change of state which is associated with a high temperature coefficient in the protoplasm. At all temperatures death by fungal disease was found to intervene after approximately the same total amount of carbon dioxide had been evolved.

MORAN (T.). **Meat and Refrigeration.** *J. Roy. San. Inst.*, 1930, **51**, 192.

Some biological aspects of refrigeration are discussed.

SMITH (E. C.) and MORAN (T.). **The Formation of Lactic Acid in Desiccated Amphibian Muscle.** *Proc. Roy. Soc.*, 1930, B, **106**, 122.

The third paper of a series dealing with the effects of freezing and drying on living amphibian muscle. Simple drying of muscles caused by the

production of lactic acid in amount identical with that produced by the corresponding degree of freezing. This confirms the view that the same effect is produced by freezing and by drying, the determining factor in each case being the removal of a certain amount of water. The highest production of lactic acid occurred at the point at which instantaneous death took place in muscle. The two events cannot be associated with a sudden change in the concentration of any constituent of the plasma of which the behaviour in physiological solution is known.

SMITH (E. C.). **On the Coagulation of Muscle Plasma.** *Proc. Roy. Soc.*, 1930, B, **105**, 579.

A preliminary report of an investigation into the physical state of the contents of the muscle fibre and the changes involved in rigor mortis.

SMITH (A. J. M.). **The Leakage of Heat into Ships' Insulated Holds.** *Food Investigation Sp. Rep.*, No. 34, 1929, H.M. Stationery Office.

The results of an experimental determination of the rate of leakage of heat into the insulated spaces of a ship. The method employed was first to cool down the spaces and then to stabilize the rate of refrigeration at a value which would just suffice to maintain the temperature steady. Measurements were then made of external and internal temperatures.

SMITH (A. J. M.). **Heat Production and Evaporation as Factors in Cold Storage.** *Proc. Brit. Assoc. Refrigeration*, 1929–30, Vol. xxvi, No. 2.

Some aspects of the relation between biology and engineering in cold storage are dealt with. Heat production and its effects are discussed in connection with the storage of apples, and experiments on evaporation connected with the storage of eggs are described.

TROUT (S. A.). **Experiments on the Storage of Pears in Artificial Atmospheres.** *J. Pomol. & Hort. Sci.*, 1930, **8**, 78.

The objects of the work were: (1) to repeat the experiments of Kidd and West; (2) to determine the optimum temperature for the Kidd-West effect; (3) to investigate the influence of carbon dioxide on this effect; (4) to study quantitatively the phenomenon of acetaldehyde production (*a*) under conditions of oxygen shortage, (*b*) during physiological (scald and core) breakdown, (*c*) in relation to the quantity of carbon dioxide produced.

(S) ENGINEERING.

LONG ASHTON FRUIT RESEARCH STATION.

HUTCHINSON (H. P.). **The Preparation of Willow Rods for Industrial Use by Decorticating Machinery; and its Economic Significance.** *Ann. Rep. Agric. & Hort. Res. Sta., Long Ashton,* 1929.

The increasing difficulties in peeling willows by hand processes are explained on the grounds of heavy costs in production and low wages and hence scarcity of peelers.

Although several peeling machines have been invented during the past four years, success was not attained until 1928, when French inventors solved the difficulty. The machine is described, and a report on the results of its work at a demonstration in Somerset in 1929 given. The chief merits of the machine are:—

(1) Rate of peeling is approximately eight times that of a hand peeler.
(2) Few rods are damaged.
(3) Light labour requirement.
(4) Long durability.
(5) A moderate price.
(6) Considerable reduction in costs of peeling.

INSTITUTE OF AGRICULTURAL ENGINEERING, OXFORD UNIVERSITY.

OWEN (B. J.). **Agricultural Engineering.** Pp. 77–108 of *Agric. Research in* 1928. Lond., John Murray, 1929 (for the Roy. Agric. Soc. of Eng.).

This article, contributed to the fourth yearly volume of the R.A.S.E., contains a review of the progress of agricultural engineering both at home and abroad during 1928. A bibliography of 60 references is appended. The most important heads deal with Electricity in Agriculture, Drills, the Combine Harvester-Thresher, and the Standardisation of Agricultural Implements. There is also a short note on Pneumatic Elevators for hay and straw, a matter which has attracted considerable attention in Germany.

OWEN (B. J.). **The Tractor: Developments of the Past Ten Years.** *The Field,* 25th Jan., 1930.

Tractors have in the last ten years become considerably cheaper. In 1920 the cost per furrow ploughed, i.e., per plough share pulled, was £150; to-day it works out at about £66. Weight has also decreased. Air cleaners are now universal, and the tractor's life is appreciably increased by their use. Starting is easier, and lubrication has been much improved. Silencers still await the attention of designers.

OWEN (B. J.). **What the Tractor Trials should prove.** *Farmer and Stockbreeder,* 5th May, 1930.

Refers to figures published by the Nebraska State University, showing the improvement which has taken place in tractors during the ten years that the Nebraska tests have run. The trials shortly to be held near Oxford should certainly afford proof of considerable advance in the construction of tractors generally, and of increased flexibility in their use. That they are indispensable would scarcely be proved, that they are gradually becoming more qualified to claim indispensability would not be denied.

Brown (C. A. C.). **The most recent Applications of Electricity to Agriculture.** *Paper contributed to the 2nd Plenary World Power Conf.*, Berlin, June, 1930.

The use of electricity on farms may be grouped roughly into (*a*) new processes, e.g., electro-culture, etc., and (*b*) substitution processes, e.g., farmyard power drive, etc. : the development of new processes is largely in the laboratory stage. Electro-culture (i.e., stimulation of growing crops by electrical discharge) is not yet established on a commercial basis.

Substitution processes are those in which electricity simply replaces some other source of power. In the farmyard the electric motor simply takes the place of the oil engine, with this difference that the electric motor may be, and often is, portable. In the dairy the main development is in the use of refrigerating machinery; on a large farm this amounts to a substantial annual consumption of energy. The electric motor is contributing to the ever-increasing popularity of the mechanical milking plant. Poultry farms make use of electricity for many purposes. Experiments have been made using electrically supplied heat for drying hops.

It is perhaps not surprising in view of the established position of steam ploughing in this country that no attempt has been made to use the electrically driven cable sets. An electrical tractor would seem to offer possibilities.

Wright (S. J.). **How the Tests may help in Choosing a Tractor.** *Farmer and Stockbreeder*, 15th Sept., 1930.

A description is given of the procedure followed in the tests. In choosing a tractor suitable power is perhaps the main consideration. An index of this is afforded by the maximum drawbar and belt tests. Fuel consumption should also be taken into account. Governor efficiency, in paraffin tractors, and comparative freedom from crank-case dilution of lubricating oil are likely to enhance economy in running costs. Durability is naturally important, but would need to be the subject of prolonged tests.

Institute of Agricultural Engineering. **World Agricultural Tractor Trials, 1930, Official Report and Catalogue.** Oxford, Hall, the Printer, Ltd.

This pamphlet of 109 pages gives descriptions and illustrations of the 30 machines tested and the results obtained by each in the scientific tests. These included belt, drawbar and field tests. Summarized results and notes on costs are also given.

ROTHAMSTED EXPERIMENTAL STATION.

Keen (B. A.) and the Staff of the Soil Physics Department. **Studies in Soil Cultivation. V. Rotary Cultivation.** *J. Agric. Sci.*, 1930, Vol. xx, Part 3.

Experiments in rotary cultivation extending over four years (1926–1929) yielded the results that with spring-sown crops—swedes and barley—rotary cultivation gives earlier and better germination and better early growth. In every experiment, however, the final yield has either been no better or else significantly below that obtained for the plots cultivated in the usual way. Meteorological factors exercise a predominating influence—the implement used being only secondary. Rotary cultivation appears to be most effective on an unkindly soil. Sieving measurements show that it does not produce an appreciably finer tilth than the usual implements, but leaves the soil initially in a much looser condition.

Keen (B. A.). **The March of Power. Lower Cultivation Costs.** *The Field*, 1930, Jan. 25th.

Keen (B. A.). **Our Cultivation Implements and their Uses.** *The Young Farmer*, April, 1930.

(T) STATISTICAL AND EXPERIMENTAL TECHNIQUE.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE UNIVERSITY.

SANDERS (H. G.). **A Note on the Value of Uniformity Trials for Subsequent Experiments.** *J. Agric. Sci.* xx, Part 1, 1930.

That soil fertility varies over one and the same field is well known; the object of this paper was to test whether these variations were constant enough from year to year to give greatly increased precision in experiments by correction from the results of previous uniformity trials. The data used were Danish ones obtained at Aarslev; in one field soil variations were reasonably constant over 4 years, but in another they were not; the general conclusion was that this method offered few possibilities except under certain rare conditions.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

HOBLYN (T. N.). **The Relationship between the Experimental and the Demonstration Plot and their Relative Value to the Investigator, the County Officer and the Fruit Grower.** *E. Malling Res. Sta. Ann. Rep.* 1929 (April, 1930). (I.—General.). 40–55.

(1) The variations to be found in horticultural crops and their effects upon modern methods of field experimentation are described.
(2) It is affirmed that Extension Trials or "Tests" carried out outside the regular research stations are an essential part of horticultural research.
(3) The difference between the demonstration plot and the experiment or test is defined.
(4) Some not very complicated arrangements of plots, suitable for such tests, are described.
(5) It is pointed out that the fruit grower cannot be expected to carry out experiments, but that demonstrations on his own farm will be of great assistance to him in obtaining the maximum benefit from the results of recent research.

HOBLYN (T. N.). **Field Experiments: The Adaptation of Modern Statistical Methods to Horticultural Conditions.** *Proc. Imp. Hort. Conf.*, 1930.

The comparative failure of the older methods of field experimentation is shown to have been due in the first place to the very variable material employed. Secondly, sufficient attention has not been paid to other causes of variation such, for instance, as soil heterogeneity. Improvements in material, technique and plot arrangement are described and an example is given of the lay-out of a modern manurial trial of apple trees.

ROTHAMSTED EXPERIMENTAL STATION.

ALLAN (F. E.). **The General Form of the Orthogonal Polynomials for Simple Series, with Proofs of their Simple Properties.** *Proc. Roy. Soc. Edin.*, 1930, Vol. 1. pp. 310–320.

In "Statistical Methods for Research Workers," R. A. Fisher has given a numerical method of polynomial fitting by means of orthogonal functions, developed from their terminal differences. It is shown here that the use

of terminal differences may be made to supply direct and simple proofs of the algebraic properties of these polynomials, and a general formula for them.

ALLAN (F. E.). **A Percentile Table of the Relation between the True and the Observed Correlation Coefficient from a Sample of 4.** *Proc. Camb. Phil. Soc.*, 1930, Vol. xxvi, pp. 536–537.

In this paper a table is furnished, for samples of four, of the 95 per cent. values of the transformed correlation, z, for different values of the correlation ζ in the population sampled. The table is based on the distribution of the correlation coefficient given by R. A. Fisher in 1915.

ALLAN (F. E.) and WISHART (J.). **A Method of Estimating the Yield of a Missing Plot in Field Experimental Work.** *J. Agric. Sci.*, 1930, Vol. xx, pp. 399–406.

In cases where a yield or other value from one plot of a field experiment is missing, a method has been developed for furnishing an estimate of the missing figure, based on all the other values. The calculation is given for experiments of the Randomised Block and Latin Square arrangements.

FISHER (R. A.). **Moments and product moments of sampling distributions.** *Proc. Lond. Math. Soc.*, Series 2, Vol. 30, pp. 199–238, 1929.

Much previous work has been expended in studying the distributions of various symmetric functions of the sample values of a variate having a known distribution, and it has been recognised that the moment functions of such statistics must be expressible in terms of the moment functions of the distribution sampled.

Only a few such expressions had, however, been obtained with exactitude, and the great complexity of these gave little promise of a solution of the general problem. It is here shown that, when the Pearsonian moments are replaced by more suitable statistics, the expressions are greatly simplified and may be obtained by a direct algebraic method. Further their general form may be derived in terms of combinatorial analysis by the use of two-way partitions, and certain pattern formulae which are the same alike for uni-variate and multi-variate problems. Rules are given, with a general demonstration, by which any particular term of any of these formulae may be obtained independently. The paper contains a table of the pattern formulae of most frequent occurrence, and a table of all the uni-variate formulae required up to the 10th degree, together with a few others of special importance. From these all the corresponding multi-variate formulae may readily be derived.

FISHER (R. A.). **The Sieve of Eratosthenes.** *Math. Gaz.*, Vol. xiv, pp. 564–566.

The note suggests that the celebrated sieve of Eratosthenes has been misunderstood through lack of recognition of the fact that its author probably had in mind not a method of testing whether any particular number is a prime, but a labour-saving device for finding all the primes in a given range of natural numbers.

It is pointed out that a very simple diagrammatic method of doing this has in fact much the appearance of a wicker sieve, and it is suggested that the sieve connected with Eratosthenes' name was in fact a wall diagram of this sort.

FISHER (R. A.). **The distribution of gene ratios for rare mutations.** *Proc. Roy. Soc. Edin.*, Vol. 50, pp. 204–220, 1930.

The discussion of the distribution of the gene ratio of the author's paper of 1922 is amended by the use of a more exact form of the differential equation to be satisfied. A method of functional equations is developed for dealing with the termini, and is shown to lead to the same solutions as the amended differential equations, in the central portion of the range, for which the latter are valid, and further to give the terminal distribution of rare allelomorphs. The method requires the investigation of a continuous function u_ν, of argument ν, satisfying the recurrence formula.

$$u_{\nu+1} = e^{u_\nu} - 1$$

From the asymptotic form of this function its expansion in the neighbourhood of $u = o$ is derived, giving the frequencies of the required distributions.

Exceedingly minute values for the selective advantage or disadvantage make a great difference to (i) the chance of success of a mutation, and (ii) the contribution of such mutations to the specific variance. The order of magnitude to be considered is the inverse of the population of the species. The neutral zone of selective advantage in the neighbourhood of zero is thus so narrow that changes in the environment, and in the genetic constitution of species, must cause this zone to be crossed and perhaps recrossed relatively rapidly in the course of evolutionary change, so that many possible gene substitutions may have a fluctuating history of advance and regression before the final balance of selective advantage is determined.

FISHER (R. A.). **Inverse Probability.** *Proc. Camb. Phil. Soc.*, Vol. xxvi, pp. 528–535, 1930.

That the principle of inverse probability includes an arbitrary and unsatisfactory element has been recognised by many writers; but their criticism has failed to settle the controversy, since they have supplied no alternative account in mathematical terms of the process of learning by experience.

This paper briefly summarizes the author's view that confusion has arisen through assuming that mathematical probability is the only measure of rational belief, and is applicable to all kinds of uncertain knowledge. It is suggested that from knowledge of a population we can express our incomplete knowledge of a sample in terms of probability, whereas knowing a sample we must express our incomplete knowledge of the population in terms of a different mathematical quantity, termed *likelihood*, which does not obey the laws of probability.

There are, however, certain cases in which statements in terms of probability can be made with respect to unknown populations. These are the typical statements of tests of significance, and the logical distinction between these and the statements of inverse probability, to which they bear a superficial resemblance, is examined.

FISHER (R. A.) and WISHART (J.). **The Arrangement of Field Experiments and the Statistical Reduction of the Results.** *Imp. Bureau of Soil Sci.—Tech. Commun. No.* 10, H.M. Stationery Office, 24 pp., 1930.

This memorandum aims at explaining the principles underlying the field experimental technique recently elaborated at Rothamsted, and gives, with appropriate illustrations from actual experiments, the full arithmetical working involved in the statistical reduction of the data. The memorandum stresses two points of importance: (1) the desirability of uniformity of procedure, and (2) the necessity for a field technique which shall minimize experimental errors and at the same time provide for an estimate of these errors by valid statistical methods.

GARNER (H. V.) and WISHART (J.). **Fertilizer Trials in 1929.** *J. Min. Agric.*, 1930, Vol. xxxvii, pp. 793–802.

In continuation of the account of fertilizer trials carried out on ordinary farms by the staff of the Rothamsted Experimental Station in a former issue of the Journal, this paper describes a further series of trials arranged in 1929. A new development is the application of the sampling method elaborated at Rothamsted to a trial on barley, with successful results.

IRWIN (J. O.). **On the frequency distribution of the means of samples from populations of certain of Pearson's types.** *Metron*, Vol. viii, pp. 1–55, 1930.

In a previous paper the author has given a general solution for the frequency distribution of the means of samples of any size, drawn at random from any population whatever, expressed as a definite integral. The present paper applies this solution to the particular cases of Pearsonian Type I and Type VII curves for integral values of the exponents p and q, which enter into the equation of the Type I curve and of the exponent m, which enters into the equation of the Type VII curve.

The cases $p = 1, 2, 3, 4$ $q = 1, 2, 3, 4$ are discussed in detail for samples of size 2, 3 and 4 from Type I populations as are the cases $m = 2, 3, 4$ for samples of size 2, 3 and 4 from Type VII populations. For the Type VII populations the cases, $m = 1$ for any size of sample, and $m = 5, 6, 7, 8$ for samples of 2 have also been considered in detail.

KALAMKAR (R. J.). **Studies in Crop Variation. VIII. An Application of the Resistance Formula to Potato Data.** *J. Agric. Sci.*, 1930, Vol. xx, pp. 440–454.

In this paper a further test is made of the validity of the Resistance formula suggested by Maskell to formulate the yield—nutrient relation in a crop. The material investigated consists of the results of the Rothamsted Potato experiment of 1929, designed to give information as to the effect on yield of applying nitrogenous, potassic and phosphatic fertilisers in various quantities. The experiment confirms the conclusions of Balmukand's paper as to the possibility of fitting the Resistance Formula to experimental data. The nitrogen constants are of the same magnitude as before, but the corresponding constants for potash cannot yet be regarded as well determined.

WISHART (J.). **The Derivation of certain High Order Sampling Product Moments from a Normal Population.** *Biometrika*, 1930, Vol. xxii, pp. 224–238.

In a recent paper on the derivation of moments and product moments of sampling distributions, R. A. Fisher dealt among other things with measures of departure from normality, and gave approximate expressions for the semi invariants of these statistics. If a higher degree of approximation is desired, further high order product moments are required, and these are deduced in this paper, while certain simple relations existing between the formulae, which will be demonstrated elsewhere, are stated, for sampling from a normal population, thus enabling the high order results to be derived from simple expressions already known.

(U) AGRICULTURAL METEOROLOGY.

ROTHAMSTED EXPERIMENTAL STATION.

Stoughton (R. H.). **Apparatus for the growing of plants in a controlled environment.** *Ann. Appl. Biol.*, xviii, 90–106, 1930.

An account of the construction of tanks and chambers for the growing of plants under independently controlled conditions of soil temperature, air temperature and air humidity. Artificial illumination is provided by two floodlights one over each chamber.

Wishart (J.). **On the Secular Variation of Rainfall at Rothamsted.** *Memoirs Roy. Met. Soc.*, 1930, Vol. iii, No. 27, pp. 127–137.

A detailed study of the rainfall at Rothamsted over the 76 harvest years 1854–1929 has revealed the fact that not only have there been sensible changes in the average yearly rainfall of a similar character to those observed at other stations in England and Wales, but the distribution of rainfall throughout the year has changed. The maximum in autumn (and equally the minimum in spring) occurs significantly later to-day than was the case 76 years ago, but there is some sign that this movement is now reversing its direction, as appeared to have happened towards the end of the eighteenth and again in the middle of the nineteenth centuries, as judged from early records at a number of other stations.

Wishart (J.) and Mackenzie (T. W. A.). **Studies in Crop Variation. VII. The Influence of Rainfall on the Yield of Barley at Rothamsted.** *J. Agric. Sci.*, 1930, Vol. xx, pp. 417–439.

The method elaborated by R. A. Fisher in his study of the effect of rainfall on wheat is here applied to the barley crop in Hoos Field, and curves are published showing for thirteen plots the benefit or loss to the final yield in bushels per acre due to an additional inch of rain over the average at any given period of the year. The main effects noted are these: (1) Excess of rain is beneficial to the barley crop for a short period in summer, and, in the case of certain plots, over the autumn and winter period. (2) Rainfall over the six months when the barley is not in the ground is just as important as rainfall in spring and summer, and the time at which the rain falls in winter is important. (3) The curves for 2-O and 2-A are essentially different in character from those of the other plots, and point to the important effect of excess of winter rain in reducing the yield of the plots having phosphate but no alkali salts (i.e., no potash, soda or magnesia). (4) Excess of rain at time of sowing is harmful in all cases. (5) The curves of the "O" series (without nitrogen) are much flatter than those of the "A" series, which have a nitrogenous dressing in addition. (6) The indication of summer benefit is not inconsistent with the conclusions of Hooker that a cool summer is desirable for barley. (7) The farmyard manure plot 7–2 bears certain resemblances to the curve for the corresponding plot 2b on Broadbalk.

(V) GENERAL AND UNCLASSIFIED.

HORTICULTURAL RESEARCH STATION, CAMBRIDGE UNIVERSITY.

Woodman (R. M.) and Taylor (E. McK.). **The Emulsifying Powers of Bentonite and Allied Clays, and of Clays Derived from these by Base Exchange and by Hydrolysis.** *J. Phys. Chem.*, 84, 299–325 (1930).

Clay-containing substances of diverse kinds and from diverse sources, and derivatives prepared from these by base exchange and by hydrolysis, have been demonstrated, in the main, to give the dual types of emulsions with various non-aqueous liquids.

A hypothesis (supported by experimental data) is advanced which brings these anomalous results into strict line with the classical conception of emulsifiers.

The unsuitability of clays as emulsifiers in the preparation of spraying stock emulsions of certain oils is discussed.

Woodman (R. M.). **A Simple Hypothesis with Regard to the Partition Coefficient existing in Ternary Liquid Systems.** *Chem. News*, **140**, 1, 17, 136 (1930).

A theoretical paper.

ROTHAMSTED EXPERIMENTAL STATION.

Brierley (W. B.). **Science of the Year 1929. Biological Sciences.** *Ann. Register*, Vol. 171, pp. 56–61, Lond., 1930.

A synthesis of biological research during 1929 arranged under the headings: (1) Evolution and Genetics; (2) Zoology; (3) General Physiology; (4) Botany; (5) Microbiology and Disease; (6) General.

Hind (H. L.) and Day (F. E.). **The Fermentation Industries.** *Repts. on the Progress of Appl. Chem., Soc. Chem. Ind.*, 1929, Vol. xiv, pp. 582–618.

A review of recent work on the proteins of barley and their behaviour during the malting and brewing. The role of hydrogen ion concentration in brewing is followed, and reference is made to recent papers dealing with certain micro-organisms of beer-infection, and with the physiological condition of brewery yeast.

Jenkins (S. H.). **The determination of Cellulose in Straws.** *Biochem. J.* 1930, **24**, 1429–1432.

Cellulose in straws may be readily determined by treating the straw with hot dilute alkali and mineral acid and then with cold alkaline hypochlorite solution. The new method gives results which are practically identical with those obtained by the Cross and Bevan procedure. The advantages of the hypochlorite method are that 12 to 16 determinations per day can be carried out by one worker, and large scale preparations of the cellulose in straws may be made without inconvenience.

NORMAN (A. G.). **The Biological Decomposition of Plant Materials. I. The nature and quantity of the furfural-dehyde-yielding substances in straw.** *Biochem. J.*, 1929, **23**, 1353–1366.

A method is given for determining the content of hemicelluloses in a plant tissue. Figures quoted for "pentosan" obtained by use of the Krober factor are unreliable because of the hexose and uronic acid groups in the hemicelluloses, and the furfuraldehyde-yielding groups intimately associated with the cellulose. If allowance be made for these and for the pectin present, a valid figure may be obtained for the pentose units of the hemicelluloses. A preparation is then made of the hemicellulose of any tissue and its pentose content determined, thus giving a factor for that material.

The nature of the hemicelluloses of oat and rye straws is given and the furfuraldehyde-yielding substance associated with the cellulose in each case, shown to be xylan.

NORMAN (A. G.). **The Biological Decomposition of Plant Materials. II. The role of the furfuraldehyde-yielding substances in the decomposition of straws.** *Biochem. J.*, 1929, **23**, 1367–1384.

The course of the decomposition of straws is followed by frequent analyses. The most prominent feature is the rapid loss of cellulose, accounting for the major part of the lost organic matter. There is a marked early loss of hemicelluloses, which is by no means complete, as certain groups are biologically less available. Subject to structural and physical variations, it is agreed that the decomposition of mature plant materials in the presence of assimilable nitrogen depends on the balance between cellulose and the available hemicelluloses on the one hand, and the resistant materials, chiefly lignin, on the other. No evidence exists for stating that the hemicelluloses are of pre-eminent importance as satisfactory decompositions have been observed in the case of straws extracted to be practically hemicellulose-free.

NORMAN (A. G.) and NORRIS (F. W.). **Studies on Pectin. Part IV. The oxidation of pectin by Fenton's reagent and its bearing on the genesis of the hemicelluloses.** *Biochem. J.*, 1930, **24**, 402–409.

Pectin readily undergoes oxidation by Fenton's reagent at 30° C., yielding products giving on hydrolysis, galactose and galacturonic acid. These are probably polymers containing mainly galactose-monogalacturonic acid and galactose-digalacturonic acid. The products resemble in appearance and general properties the structural hemicelluloses, and some support is lent to the view that the hemicelluloses may be formed in nature by the protracted mild oxidation of pectin.

NORMAN (A. G.) and MARTIN (J. T.). **Studies on Pectin. Part V. The hydrolysis of pectin.** *Biochem. J.*, 1930, **24**, 649–660.

Hydrolyses of pectin were carried out with hot dilute alkali and acid, and the rate of hydrolysis followed by analyses. The pectin ring seems peculiarly susceptible to the former and is very rapidly destroyed. Certain dienolic fission products of sugars are formed, and render the determination of the uronic acid content unreliable. In the course of mild acid hydrolysis there is firstly a production of pentose by simple decarboxylation of the uronic groups. Later, degradation products probably of a furan type are formed.

No conclusions as to the arrangement of the units in the pectin molecule, or as to the type of linkage involved can be drawn from hydrolytic studies owing to the production of degradation compounds interfering with analyses.

DEPARTMENT OF ZOOLOGY AND COMPARATIVE ANATOMY, OXFORD UNIVERSITY.

MIDDLETON (A. D.). **Cycles in the numbers of British Voles** (*Microtus*). *J. Ecol.*, Vol. xviii, pp. 156–165, 1930.

It has been found that past maximum years for field voles (*Microtus*) show a regular periodicity of approximately four years. The causes of this cycle are not yet fully understood, but there is evidence that disease is the controlling mechanism in some instances, and that climatic factors are also involved.

MIDDLETON (A. D.). **The Ecology of the American Grey Squirrel** (*Sciurus carolinensis*) **in the British Isles.** *Proc. Zool. Soc.*, 1930, Part III.

Details are given of 33 centres of introduction for grey squirrels in the British Isles since 1889, and the resulting spread and distribution of the species is traced up to 1930, large areas being now occupied in Southern England, Cheshire, Yorkshire, Scotland and Central Ireland. Evidence is brought forward showing that the grey squirrel is becoming a serious pest to agriculture and forestry. It is also shown that the British Red Squirrel is subject to violent fluctuations in numbers, accompanied by disease.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

DAVIES (W. MALDWYN). **Notes on the Contents of the Crops of Wood Pigeons.** *N.W. Nat.*, Vol. 5, No. 2, pp. 92–95, June, 1930.

The damage caused by wood pigeons to the clover, and, later, to the root and cereal crops is, in the opinion of the farmers of Anglesey and Caernarvonshire, on the increase.

The crops of wood pigeons shot in the organised shoots during February, 1930, were examined.

The main source of food of the wood pigeon during February was Ivy Berries (max. of 725 in one crop); leaves of *Ranunculus Ficaria* (max. 1,725); *R. bulbosus* (max. 1,214); while Wild White Clover and *Rumex acetosa* were present in small quantities. In the light of previous work, these observations emphasised the value of making examination of the crops throughout the season.

DAVIES (W. MALDWYN). **Damage to Mangold by Rodents.** *J. Min. Agric.*, Vol. xxxvii, No. 3, pp. 269–276.

During the dry summer of 1929, young mangold plants on Caernarvonshire farms were destroyed by rodents, chiefly hares. Destruction was due to the complete severance of the root. A comparison of the damage with that caused by Springtails (Collembola) is given.

The damage warranted the carrying out of control measures, and the best results were obtained by incorporating Whizzed Napthalene in a top dressing of Nitrate of Soda (14 lb. of Napthalene in 1½ cwt. of Nitrate of Soda).

The accumulation of data in control experiments in the case of a migratory pest, where the area visited by the pest can be located, is discussed.

BRISTOL UNIVERSITY.

LING (A. W.), MACEACHARN (C. A.) and READ (E. C.). **Mole Destruction Experiments.** *Univ. Bristol Bull., No.* 4.

The experiments described in this bulletin were commenced in 1928 in order to test the relative efficacy of (*a*) baits containing Red Squill (*Urginea*

maritima); (*b*) gassing, and (*c*) trapping, as means of ridding badly infested land of moles. The conclusions made are (*a*) that baits prepared from Red Squill either in liquid or powder form are quite satisfactory provided that they are handled with great care and the run is disturbed as little as possible; (*b*) that gassing is satisfactory provided that the whole area is treated—this to include retreats in hedgerows, etc.; (*c*) trapping is very satisfactory in the hands of an experienced person and is recommended on large estates or where there is sufficient work to justify the employment of a professional trapper.

MIDLAND AGRICULTURAL COLLEGE.

ROEBUCK (A.). **Autumn Migration of Birds on the Coast of Lincolnshire in 1929.** *Trans. Lincs. Nat. Union*, 1929.

The stretch of coast chosen was between Chapel Point and Huttoft Bank. A list of the birds which breed in the area is given, founded upon examination of the district earlier in the year. The migrants are recorded as they appeared. It was hoped to get more exact knowledge on the migrant rooks, but very little progress was made.

APPENDIX I.

List of Government Departments, Research Institutes, Advisory Centres, etc., Contributing the Abstracts.

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APPENDIX III.

List of Abbreviations of Titles of Periodicals, etc., used in this Volume.

Agric. Prog.	Agricultural Progress.
Amer. J. Physiol.	American Journal of Physiology, Boston.
Amer. Nat.	American Naturalist, Boston.
Ann. Appl. Biol.	Annals of Applied Biology, Cambridge.
Ann. Bot. Oxford	Annals of Botany, Oxford.
Ann. & Mag. Nat. Hist. ..	Annals & Magazine of Natural History.
Ann. Rep. Agric. & Hort. Res. Stat., Long Ashton.	Annual Report of the Agricultural and Horticultural Research Station, Long Ashton.
Ann. Rep. Soc. Chem. Ind. ..	Annual Report of the Society of Chemical Industry.
Biblio. Genet.	Bibliographia Genetica, The Hague.
Biochem. J.	Biochemical Journal.
Biol. Gener.	Biologia Generalis, Austria.
Brit. Goat Soc. Yr. Bk. ..	British Goat Society's Year Book.
Brit. J. Exp. Biol.	British Journal of Experimental Biology.
Brit. Med. J.	British Medical Journal.
Brit. J. Tuberc.	British Journal of Tuberculosis, London.
Bull. Entom. Res.	Bulletin of Entomological Research.
Edin. Med. J.	Edinburgh Medical Journal.
Entom. Mon. Mag.	Entomologist's Monthly Magazine.
Essex F.U. Yr. Bk.	Essex County Farmers' Union Year Book.
Gard. Chron.	Gardeners' Chronicle.
Gard. Yr. Bk.	Gardeners' Year Book.
J. Agric. Sci.	Journal of Agricultural Science, Cambridge.
J. B.D.F.A.	Journal of the British Dairy Farmers' Association.
J. Comp. Path. & Thera. ..	Journal of Comparative Pathology and Therapeutics.
J. Dairy Res.	Journal of Dairy Research.
J. Ecol.	Journal of Ecology, London.
J. Gen. Physiol.	Journal of General Physiology, Baltimore.
J. Genet.	Journal of Genetics, Cambridge.
J. Helm.	Journal of Helminthology.
J. Hered.	Journal of Heredity.
J. Hyg. Camb.	Journal of Hygiene, Cambridge.
J. Inst. Brew.	Journal of the Institute of Brewing, London.
J. Inst. Petrol. Technol. ..	Journal of the Institution of Petroleum Technologists.
J. Kent F.U.	Journal of the Kent Farmers' Union.
J. Linn. Soc.	Journal of the Linnean Society.
J. Min. Agric.	Journal of the Ministry of Agriculture and Fisheries.
J. Min. & Geol. Inst. India ..	Journal of the Mining and Geological Institute of India.
J. N.I.A.B.	Journal of the National Institute Agricultural Botany, Cambridge.
J. Obstet. Gynaec.	Journal of Obstetrics and Gynaecology of the British Empire, London.
J. Path. Bact.	Journal of Pathology and Bacteriology, London.
J. Phys. Chem.	Journal of Physical Chemistry.
J. Physiol.	Journal of Physiology, London and Cambridge.
J. Pomol. & Hort. Sci.	Journal of Pomology and Horticultural Science, Maidstone.
J. R. Hort. Soc.	Journal of the Royal Horticultural Society, London.
J. R.A.V.C.	Journal of the Royal Army Veterinary Corps.
J. S.E. Agric. Coll.	Journal of the South-Eastern Agricultural College, Wye, Kent.
J. Soc. Chem. Ind.	Journal of the Society of Chemical Industry.

J. Surv. Inst.	Journal of the Surveyors' Institution, London.
Math. Gaz.	Mathematical Gazette.
Milk Ind.	Milk Industry.
Milk Rec. Soc.	Milk Recording Society.
Min. Agric. Bull...	Ministry of Agriculture and Fisheries, Bulletins.
Min. Agric. Econ. Ser. ..	Ministry of Agriculture and Fisheries, Economic Series.
Min. Agric. Misc. Pub.	Ministry of Agriculture and Fisheries, Miscellaneous Publications.
N.P.B.A.	National Pig Breeders' Association.
N.W. Nat.	North-Western Naturalist.
Parasitol.	Parasitology.
Physiol. Rev.	Physiological Review.
Pig Breed. Ann.	Pig Breeders' Annual.
Proc. Assoc. Econ. Biol.	Proceedings of the Association of Economic Biologists.
Proc. Camb. Phil. Soc.	Proceedings of the Cambridge Philosophical Society.
Proc. Geol. Soc. Lond.	Proceedings of the Geological Society of London.
Proc. Inter. Math. Cong. ..	Proceedings of the International Mathematical Congress.
Proc. Roy. Soc.	Proceedings of the Royal Society, London.
Proc. R. Soc. Med.	Proceedings of the Royal Society of Medicine, London.
Proc. Zool. Soc.	Proceedings of the Zoological Society of London.
Quart. J. Expt. Physiol. ..	Quarterly Journal of Experimental Phsiology, London.
Rev. App. Entom.	Review of Applied Entomology, London.
Rev. App. Myco.	Review of Applied Mycology, London.
Sci. Prog.	Science Progress.
Scott. J. Agric.	Scottish Journal of Agriculture.
Trans. Brit. Mycol. Soc. ..	Transactions of the British Mycological Society.
Trans. Highl. Agric. Soc. Scot. ..	Transactions of the Highland and Agricultural Society of Scotland, Edinburgh.
Trans. Lincs. Nat. Union ..	Transactions of the Lincolnshire Naturalists' Union.
Trans. 2nd Comm. Inter. Soc. Soil Sci.	Transactions of the Second Commission International Society of Soil Science.
Trop. Agric.	Tropical Agriculture, Trinidad.
Vet. J.	Veterinary Journal.
Vet. Rec.	Veterinary Record.
Welsh J. Agric.	Welsh Journal of Agriculture.
Welsh Plant. Breed. Stat. Bull ..	Welsh Plant Breeding Station Bulletin.
Zbl. Bakt.	Zentralblatt für Bakteriologie, Parasitenkunde u. Infektionskrankheiten, Jena.

APPENDIX IV.

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